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To Advertisers

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NEW ADVERTISEMENTS should be in the office not later than Monday noon to insure publication in that week's issue.

Most people when they look at a trolley car think that it is a machine complete in itself. Those who know a little more about it take into account the power station, and some even go so far as to consider the transmission line as a portion of a united whole. But very few, indeed, consider the track as part of the transportation machine, yet the track is as truly a part of this mechanism as is the car itself, and it is equally important. A trolley road is a machine tool for the transportation of people, and every part of it is equally important with every other for its operation. The moral of all of which is that a good track is vital to successful electric railway operation.

SUMMER.

At last the summer is here—the season when the business of central stations dwindles away and the time for doing all sorts of outside and inside work and improvements about the power-house, the transmission line and the distribution network. It is well, at the beginning of the summer, for the managers of these enterprises to look forward to the activities of the fall and plan wisely the installation of necessary enlargements and the general bettering of the plants during the time when this may be most easily done.

There are nearly two thousand electric lighting central stations in the United States, of which about one-half are living from hand to mouth, and either simply paying their way, or else (and worse) earning what the newspapers call an "Irish dividend." Since electric lighting is a thoroughly understood business, with its product in demand and the methods of producing it thoroughly up to the standard of other modern industrial enterprises, it seems to be reasonable that no such business should be worked at a loss. The reason why much of the loss is suffered is because of ignorance or unwillingness to expend the necessary capital to turn loss into gain. For instance, a very large majority of our central stations are throwing away the hot steam which is a valuable and salable by-product. This is the season of the year for managers to consider the installation of a steam heating system for next winter in connection with their plants, and to investigate this highly important subject at length. It is stated upon unquestionable authority that such systems have often paid enough to change a loss into a profit on the general balance sheet of the business.

In the United States the value of storage batteries as accessories in central station plants is not, apparently, so well understood as it is elsewhere. This is an excellent time to consider the question of installing batteries for the general betterment of the station's lighting business, and for earnest consideration of the fact that batteries, like steam heating installations, often pay for themselves manifold.

When the station manager takes his vacation in June or July and goes off to some spot where he no longer hears the puff of engines or the purr of dynamos, he will do well to take with him copies of the transactions of the last two conventions of the National Electric Light Association, and ponder over the results of experience in the two directions indicated above therein set forth. If he ponders the right kind of way and has the right kind of stockholders behind him, he will come home from his vacation by way of some centre of manufacture where batteries and heating plants are built, and leave some orders.

THE CONVENTION.

The convention of the Independent Telephone Association of the United States which has just closed in Buffalo was, as might have been expected from the programme, of unusual excellence. Doubtless the results that will flow from the deliberations of telephone managers there held will be of value to the whole art of telephony for a long time to come.

In the very complete report of the proceedings which appears in other pages of this issue will be found at some length abstracts of these discussions, and from them the excellent tone of the gathering may be understood. The independent movement seems to be well on its feet and to have passed the period of struggling immaturity. It has certainly grown to be a great industry.

Everybody had a good time at the convention, as everybody should have, and it is believed that this meeting with all of the electrical magnificences at the Pan-American Exposition for its background will long be remembered as one of the pleasantest and most profitable in the history of the association.

THE BRAKE QUESTION.

One of the strongest elements that influences engineering design is the conservatism which bids us adhere faithfully to the thing which is done and customary, and not to question the wisdom of those who have gone before by endeavoring to improve upon their work. For this reason there often lingers along in engineering work some tradition or some survival of a method or a design that is a pure anachronism.

To this day in Great Britain it is easy to trace the lines of the stage-coach in the shape and arrangement of the railway passenger car. So, in the United States, we find the motorman of a trolley car, with a hundred horse-power at his command for starting the car and keeping it moving, equipped with the same unsatisfactory manual contrivance that our grandfathers used to stop the one-horse and two-horse cars that were regarded as an innovation sixty years ago.

When the late John Stephenson built the first street-car track on Fourth avenue, in New York city, along in that delicious period when bell-crowned hats and hoop-skirts were fashionable, it required only the united effort of two horses to drag along the vehicle (modeled precisely upon the lines of a stage-coach), and the driver, sitting in the front, could bring it to a stop by means of a hand-operated brake. In those days it was not foreseen that the same thoroughfare would become a double-deck railway track along which cars weighing many tons would be driven by almost irresistible power at high speeds. Certainly if it had been no one would have ventured the rash assertion that the only thing to survive would be the inefficient and entirely unsatisfactory hand-brake. Such, however, is the case, and the hand-brake is the only means of stopping cars in use on by much the larger part of our high-speed interurban and suburban trolley lines, not to mention city lines. One has to go no further than the newspaper to read about the consequences. Every summer sees an increasing total of deaths and disasters due to this outgrown piece of apparatus.

It would not be so bad were there not power brakes in plenty of excellent reputation, well tested, thoroughly reliable and not unreasonably expensive. The cost of a single accident, which might be prevented by power brakes in most cases, will far more than pay for the equipment of the entire rolling stock of the road. As a mere matter of insurance the management of electric roads should see the wisdom of thus equipping their cars.

To the engineering eye it looks as ridiculous to see a heavy trolley car with its powerful motors giving a swift starting acceleration and its one-man-power hand-brake, as it would to see the most elaborate and powerful air-brakes, fit for locomotives, installed on the bob-tail car of our childhood. The increasing use of air and electric brakes is a gratifying symptom that railway superintendents are waking up to this evident fact, but unless suburban trolley companies are more active in this matter it is feared that in some sections their pace toward a power-brake equipment will be swiftly and unceremoniously accelerated by the state legislatures requiring immediate installation of such apparatus. As a general thing it is a bad plan for legislatures to interfere, but if the interference took this form they would make no mistake.

CUBA WANTS THE TELEPHONE.

A gentleman who recently returned from Cuba believes that the telephone has a wonderful future before it in that island. Under the heat of the southern skies and in a land where it seems always afternoon, the energetic northerner readily can appreciate the advantages of telephonic communication. By its employment no one needs to incur the danger of sunstroke or being drenched in the wicked downpours of rain so frequently seen in the wet season in southern latitudes. The characteristics and racial tendencies of the Latin-American countries, combined with climatic conditions, render it almost positive that as soon as the telephone's advantages are appreciated they will be adopted immediately. It is far less fatiguing to take down the receiver and hold a conversation with your neighbor or friend over the wire than it is to urge an unwilling pen over the paper or to call in person at the house or office of the one with whom communication is desired.

FARMERS' COOPERATIVE TELEPHONE EXCHANGES.

In the Middle West the farmer has taken most kindly to the idea of telephone connection. Up to a few years ago some political economist had expressed a fear that the condition of the farming population of this country was such that the younger men were leaving the soil and going to the cities, where, if they made no better wages, at least they were not so lonely and isolated as they were upon the farm. The ever-widening influence of the trolley car has done much to dispel this trouble, and now the telephone has come to put the agriculturist into immediate contact with the city and with his markets.

The effect of the telephone in this connection has been twofold. In the first place, by putting the rural family in connection with the city, and thus indirectly with the world at large, it seems greatly to enlarge their mental horizons and benefit them in many ways outside of our province to discuss. In the second place, by enabling the farmer to keep posted concerning the condition of the markets in which he sells and buys, it enables him so as to adjust his shipments of produce as to sell on the high market, and thus vastly improves the revenues from his business. So far, the majority of these farmers' cooperative exchanges, wherein the individuals contribute to the erection of a line of their own, has been largely confined to the Middle Western states. A good example is to be found of a company organized a year ago at Bowers Station, Montgomery County, Ind. This has now increased so that forty townships are connected and over six thousand telephones are in use. Prices are adjusted so that the company makes no profit, the present rate being that each subscriber pays three dollars initiation fee and a monthly fee of twenty-five cents, in addition to which he maintains and keeps in repair his own line. The movement is symptomatic and stands as an illustration of what we may expect to see the telephone do.

The full utility of the telephone is only just beginning to be realized, and it is not idle to believe that this instrument will soon become practically, if not actually, universal.

Science Brevities

Platinized Porcelain—A German patent has recently been issued to Dr. Heraeus for a process of producing a platinum coating on porcelain. The surface of the biscuit is coated with the preparation of platinum salts described in the patent, and then heated to a sufficiently high temperature to fuse the coating. The surface thus becomes covered with a conducting covering of platinum which is very durable and much less expensive than the thinnest sheet. This is stated to be economically adapted for the manufacture of resistances, as the film can be made continuous for considerable length and yet of high resistance and great durability.

Ferro-Silicon—According to a French technical journal the works for the electric manufacture of ferro-silicon on a commercial scale at Méran, France, have lately started under the direction of M. Rançon. The mixture used in the operation consists of 1,000 parts scrap iron, 410 parts of quartz sand and 398 parts coke. The yield of ferro-silicon is 1,240 kilos (2,732 pounds) for each furnace per 24 hours, or 200 grammes, which is 0.4 pound, per kilowatt-hour. The product consists of 77.5 per cent iron, 21.5 per cent silicon and about one per cent of other matter, and costs about 200 francs ($40) per ton. The poorer alloy of commerce contains one-half as much silicon and is sold at nearly the same price.

Aluminum Electrodes—Much experimenting is now being done on the curious phenomena presented by aluminum electrodes, especially with reference to using them for rectifying alternating currents. Signor A. Bartorelli states that the transition resistance, when an aluminum electrode is an anode, is inversely proportional to its sectional area and that this demonstrates that the resistance is confined to the contact surface between metal and liquid. The resistance decreases gradually as the density of the current increases, and it is believed that this is due either to a chemical or physical transformation of the non-conducting layer. Regarding the nature of the one-sided resistance of an aluminum anode, the author concludes that for small electro-motive forces it has a true resistance effect, but for larger electro-motive forces it has a polarization effect.

Adjustable Condenser—In an Italian physical journal, Sig. G. Ercolini describes a variable condenser which is claimed to be better than the Briggs form, wherein flexible mica plates are used subjected to varying pressures. It is well known that in this type of adjustable condenser the law connecting the variation of pressure with capacity is uncertain, and for this reason the author suggests the use of glass plates instead of mica. These are mounted one above the other on metallic shelves laid on a hard rubber frame, the whole arranged so that it can be sheared like a parallel ruler. In this way the glass plates may be made to approach each other to any desired extent. The metal plates consist of tinfoil cemented to both surfaces of the glass. The capacity varies, of course, directly as the cosine of the angle of inclination of the edge of the plates. The apparatus is equally useful as a dry condenser or when immersed in a liquid dielectric.

Dielectric Constants—Maxwell's theory, combined with the principle of the conservation of energy, may be employed for finding rules governing the relations between temperature and pressure on the one hand, and the dielectric and magnetic constants of a substance on the other hand, says the *Electrician*. Such investigations serve to impart a physical significance to the rules of Clausius-Mossotti, Lorenz, Beer and others, which are based upon molecular hypotheses. Herr J. Koenigsberger has arrived at equations differing essentially from those found by Thomson, Drude, Duhem and others, owing to the fact that he takes into account certain quantities of energy not considered by those authors, and which, he thinks, make a good deal of difference in the case of high dielectric and magnetic constants. He shows that in solid and liquid bodies the change of a parameter in the electric field has a different effect from that which it would have outside the electric field (or the magnetic field in magnetic substances), and that when such substances are electrified, the phenomena of electrostriction, of Thomson's heating, etc., must be observed.

Disruptive Discharge in Electrolytes—MM. André Broca and Turchini have found, in experimenting with electric oscillations of a wave-length of some 400 m., corresponding to a frequency of about one million per second, that the properties of the electrolyte placed in the discharge circuit were profoundly modified, says Mr. Fournier d'Albe. Under favorable conditions very powerful disruptive discharges passed through highly conducting liquids, thus showing that for this order or frequency the electrolytes behave as dielectrics. This is a clear experimental explanation of the fact that the electrolytes in question are transparent to light, as they should be according to Maxwell's law. The authors employed a large induction coil fed by a current of 50-amperes at 110 volts, and 42 cycles per second. The capacity inserted was 12,500 electrostatic units. The sparks produced in acidulated water were extremely brilliant, and the electrodes wore away rapidly. Distilled water shows the phenomenon in great violence, and the sparks remain brilliant when sulphuric acid is gradually added, disappearing, however, when the concentration reaches 1 in 40. In copper sulphate brilliant effects are obtained, even in a 24 per cent solution. The authors believe that at sufficiently high frequencies all transparent electrolytes behave as dielectrics.

Reducing Action of Calcium Carbide—Considerable promise has been held out by the behavior of calcium carbide as to its future use as an important element in metallurgical processes. In a German contemporary, Herr F. von Kügelgen describes a series of experiments relating to the use of carbide as a reducing agent. Lead, bismuth, chromium, molybdenum, tungsten, manganese, nickel, sodium, potassium, aluminum and cerium were dealt with in his investigations. In most cases he found that the reduction of the oxide or the chloride to the metallic state was possible. The action of the carbide seemed strongest in the case of the chlorides, and generally when the reduction was started sufficient heat was generated by the chemical action to carry the reaction forward without external heating. With the oxides this phenomenon was not noticed. Reductions made of mixtures of chlorides and oxides gave very favorable results. Carbides of the reduced metals were formed only in those cases when the reduction temperature approached that required for carbide formation, and metals more free from carbide impurities may be obtained by the new method of reduction than from the old method of using carbon itself. By using only the amount of carbide called for by chemical theory an excess of calcium in the product was avoided. For blow-pipe reductions in laboratory work it is believed that carbide will prove very useful. The author states that in metallurgical work, under ordinary conditions, 202 kilogrammes (442 pounds) will yield 1,000 kilogrammes (2,204 pounds) of copper, and other metals in equivalent proportions. Economical reduction of copper ore by carbide is not feasible at present, but the author believes that for producing nickel and bismuth the method should prove practicable. By using a mixture of the oxide and chloride of two metals it is possible in one operation to obtain an alloy by this means which might otherwise be very difficult to procure.

THE THEORY OF ALTERNATING DYNAMO ELECTRIC MECHANISMS—XXX.

BY W. ELWELL GOLDSBOROUGH.

Example 17.

Given: A bank of ten 16-candle-power incandescent lamps designed for a 110-volt circuit. The lamps are supplied with current from a central station one mile distant. The line consists of two parallel overhead wires running from the station to the point of supply; each wire is of copper, No. 4 American wire gauge, fixed on pole insulators, with a distance between their axes of 30 inches. The resistance of the line will, therefore, be about 2.57 ohms. It will have a distributed inductance of .0038 henry. The maximum voltage supplied at the station is 105 volts at a frequency of 120. How can a current at a 110 volts pressure be supplied to the lamps without the use of a transformer?

Solution: Referring to Fig. 81, draw OA_1, equal to the electro-motive force that must be supplied at the lamps. $OA_1 = 110$ volts. At this pressure the lamps will take five amperes.

Now if

r_1 represents the resistance of the line,
L_1 " " " inductance " "
E " " " station E.M.F.,
E_1 " " " line E.M.F.,
E_2 " " " E.M.F. at the lamps, and
I_2'' " " " current through the lamps,

we can draw $OC_a = r_1 I_2'' = 2.57 \times 5 = 12.5$ in phase with OA_1, and from C_a the extremity of OC_a lay off $C_aA_a = L_1 \omega I_2''$, 90° in advance of the current $I_2'' = OB_2''$. Then OA_a will equal E_1, the electro-motive force necessary to overcome the impedance offered by the line to the flow of the current. If now we lay off A_1A^a equal and parallel to OA_a, the vector sum of OA_1 and A_1A^a will equal OA^a, the electro-motive force that must be impressed upon the line at the station, under the present conditions, to produce the necessary voltage at the lamps

Now suppose a condenser is placed in parallel with the lamps. Since the new circuit is without resistance the current I_2' that will flow in and out of the condenser will be 90° in advance of OB_2'', the current flowing in the lamps. Let $OB_2' = I_2'$, then OB, the resultant of OB_2'' and OB_2', will equal the new line current. From this we see that, as the capacity of the condenser is increased, the locus of the line current vector head will be out along the line $B_2''B$. Also, since $I\,r_1$ varies as I (the line current) both in amount and phase, therefore the heel C_a of the line triangle of electro-motive forces will move out along the line C_aC_b, and, consequently, the extremity of the line electro-motive-force vector OA_a will move at right angles to OA_a from A_a along A_aA_b, since the numerical value of E_1 varies as $I\,r_1$, but the phase angle between them remains constant. Therefore, with a condenser current OB_2' flowing, C_a will move to C_b, making OC_b in phase with OB, and A_a will move to A_b. The electro-

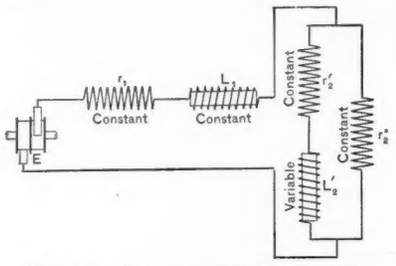


FIG. 83.—ALTERNATING MECHANISMS.

motive-force triangle will have, therefore, the new position OC_bA_b, and OA_b equals E_1, equals the new value of the line electro-motive force.

From A^a lay off A^aA parallel to A_aA_b and from O as a centre with a radius equal to 105, the station electro-motive force, describe the circle *abcd*. The point A at which the circle intersects A^aA determines the value and phase relation of A_1A, which is the final value that must be given the line electro-motive force before the conditions of the problem can be fulfilled.

To determine the value of the capacity that will produce this result, from O draw OA_b parallel to A_1A until it intersects A_aA_b. Lay off the line OB lagging

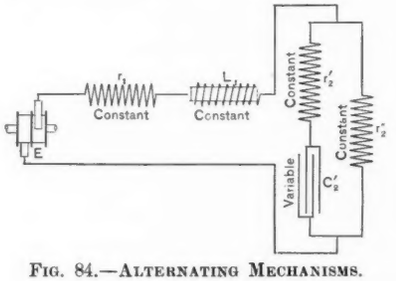


FIG. 84.—ALTERNATING MECHANISMS.

$$\phi_1 = \tan^{-1} \frac{x_1}{r_1} = 48° 9'$$

behind OA. Produce OB until it intersects $B_2''B$ at B, and from B let fall the perpendicular BB_2' on O z, O z being drawn 90° in advance of OB_2'' from O. OB_2' will be the value of the current that must flow in the condenser to produce the desired result, and since the condenser circuit is without resistance

$OB_2' = I_2' = C_2' \omega E_2$, and, therefore, $C_2' = I_2' \div \omega E_2$.

In the problem under consideration, $I_2' = 8.50$, therefore $C_2' = 103$ micro-farads.

The power supplied to the circuit under these conditions equals $W = EI \cos \phi = 105 \times 9.9 \times .766 = 796$ watts. To have produced the same result by raising the voltage at the station would have required an electro-motive force $= OA^a = 123.5$ volts impressed upon the line or an expenditure af power equal to $123.5 \times 5 \times \cos(A_1OA^a) = 123.5 \times 5 \times .993 = 613$ watts. The condenser method requires 30 per cent more power.

ON VARIABLE REACTANCE IN PARALLEL CIRCUITS.

In connection with Fig. 81 we have studied certain phenomena which result from placing a condenser in parallel with a non-reactive receiving circuit. We will now take up somewhat more in detail the study of similar effects produced by a variable reactance when connected in the branch circuits of the class of systems shown in Figs. 71 and 76.

In Figs. 83 and 84 we have an example of the specific type of alternating-current distributing system to be studied. Fig. 83 presents conditions which admit of a variation of the inductance of the branch circuit O'A' between the limits infinity and zero; and in Fig. 84, which is supplementary to Fig. 83, conditions are presented which admit of the reactance variation being continued by the introduction of a condenser having a capacity varying in value between the limits infinity and zero. In studying this system we will follow the previous method of assuming that, initially, a constant receiver electro-motive force is maintained between the terminals O and A_1; and in Fig. 85 we have the vector diagram illustrating the resulting effects. In this figure OA_1 is the constant electro-motive force maintained between the terminals O and A_1. OB^a is the constant current which the constant receiver electro-motive force sets up in the non-inductive branch circuit O''A''. This branch current will cause an impedance drop in the transmission line equal to the vector $OA_{2_{ii}}$, which is the resultant of the resistance line drop $OC_{2_{ii}}$ and the reactive line drop $C_{2_{ii}}A_{2_{ii}}$. If, now, we consider that the circuit O'A' is connected in with the system, having, at the time of its introduction, a very high inductance, a lagging current such as $OB_{2_i}{}^b$ will be set up in the circuit. This current, freed from association with branch current OB^a, would cause a line impedance drop equal to OA_b; where OA_d is the resultant of the resistance and reactance electro-motive forces induced in the line A_1A by the current $OB_{2_i}{}^b = I_2'$.

When both the circuits O'A' and O''A'' are closed the current flowing in the circuit O''A'' is productive of a line impedance drop $OA_{2_{ii}}$, and the current $OB_{2_i}{}^b$

flowing in the circuit O′A′ is productive of a line impedance drop OA_b; therefore, with both circuits closed, there will be a total line impedance drop equal to the resultant of the vectors OA_{2_u} and OA_b. The vector sum of these, in their relation to the receiver electro-motive force, is shown by OA_1, A_1A^a and A^aA^b, since A_1A^a is parallel to OA_{2_u}, and the line connecting A^aA^b would be parallel to OA_b. We have, then, this condition; that, when the circuit O′A′ is open, the electro-motive force which must be developed by the generator in order to maintain the receiver voltage OA_1 is equal to OA^a, but when the receiver circuit O′A′ is closed with a flow of current equal to I_2', the resultant generator electro-motive force necessary is increased to the value OA^b.

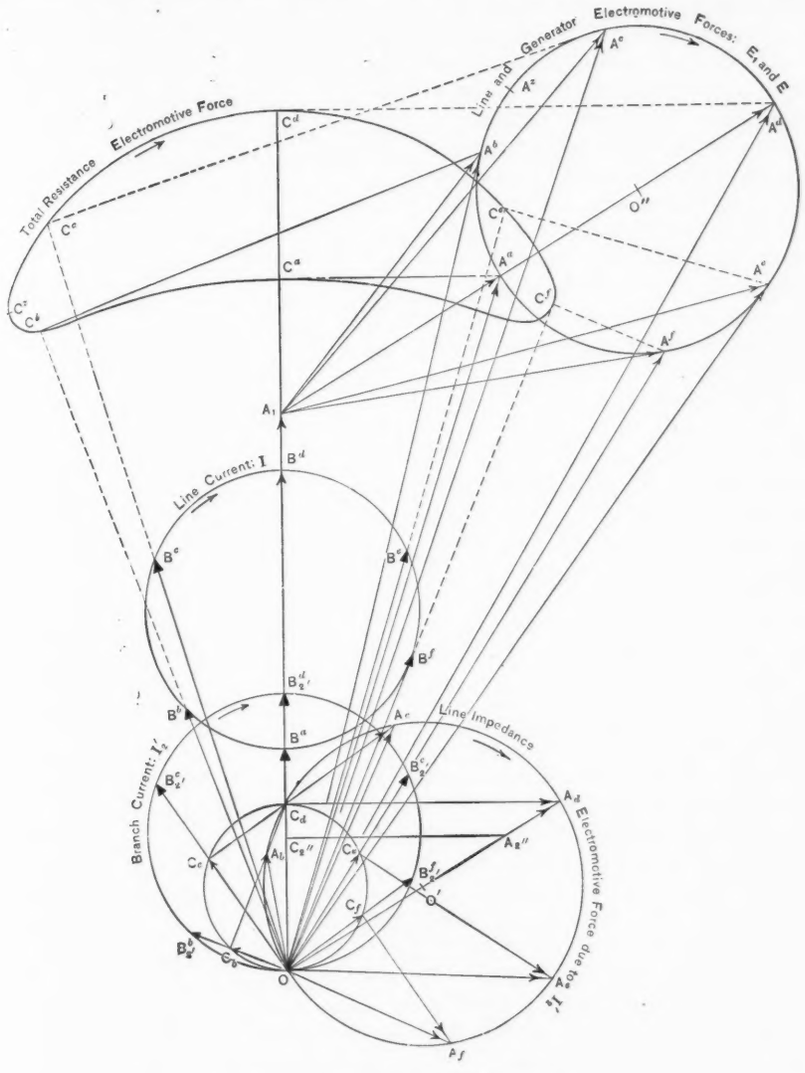


FIG. 85.—ALTERNATING MECHANISMS.

We can now profitably note the laws governing the variations taking place in the circuit O′A′ as the inductive reactance of this circuit is reduced.

It has already been pointed out on page 360, Fig. 55, that when the inductance of a reactive circuit, influenced by a constant electro-motive force, is reduced, the current increases in such a way that, while the angle of its lag behind the impressed electro-motive force diminishes, its vector head traces a circular locus. Following this construction, then, we can lay off the vector $OB_{2_i}{}^d$ equal to the current which will flow in the circuit O′A′ when the reactance of the circuit is zero; and, upon this vector as diameter, describe the locus circle $OB_{2_i}{}^bB_{2_i}{}^cB_{2_i}{}^dB_{2_i}{}^eB_{2_i}{}^fO$; and we will then have determined the path followed by the current vector head B_{2_i} when the reactance x_2' of the circuit O′A′ is reduced. For example: A certain reduction in the value of x_2' will cause the current I_2' to assume the phase position and value $OB_{2_i}{}^c$. With this value, since the line resistance is a constant, the point C_b will move to the point C_c, also along a locus circle, and, in like manner, the point A_b will move to the point A_c along a second locus circle; and we find we have a perfectly definite relation established between the branch current in the circuit O′A′, and the line drop which this current, considered alone, produces in the circuit A_1A, for the heel of the line impedance triangle, due to the current I_2', as I_2' increases, will follow the trace of the circle $OC_cC_dC_fO$, and the apex of this triangle will follow the circle $OA_bA_cA_dA_eA_fO$.

In the further development of the discussion we will transfer the impedance locus circle $OA_bA_cA_dA_eA_fO$ to such a position that the resultants of the impedance vectors which it encloses with the vector OA_{2_u} may be readily taken in determining the total line impedance drop, due to both the constant current I_2'' and the variable current I_2'; therefore, we will lay off the line A_1A^a equal to OA_{2_u} and on an extension of A_1A the point O″, distant from A by the length OO′. Now about O″ as a centre, and with a radius equal to one-half of OA_d, describe a circle. This circle $A^aA^bA^cA^dA^eA^fA^a$ is the locus traced by the total line impedance electro-motive-force vector, as the reactance of the circuit O′A′ varies; for the vectors connecting the point A_1 with points properly located on the circle will be equal to the resultant of the line impedance electro-motive forces due to corresponding branch currents. Take, for example, such a value of x_2' as results in determining the value of I_2' in the position of $OB_{2_i}{}^c$, then, by construction, OA_c equals the line impedance electro-motive force due to I_2'. If, then, a line is drawn from A^a parallel and equal to OA_c it will determine with A_1A^a the value of the line impedance electro-motive force due to I_2' and I_2''.

Carrying out this construction we find that the distance between A^a and A^c is equal and parallel to OA_c; consequently the point A^c falls on the line impedance electro-motive-force circle and A_1A^c is the value of the line impedance electro-motive force induced by the actual line current.

New Bridge Footpath Completed.

Shortly before noon on June 4 the footpath of the new East River Bridge, in New York city, was completed, and Messrs. William Hildenbrand, chief engineer, Isaac Hartz and H. B. Robinson, of the Roebling Construction Company and the East River Bridge Commission, crossed the river on the narrow path. As soon as the hand-rails are in place Mayor Robert A. Van Wyck and the members of the Bridge Commission will make the first official trip and be welcomed by the city officials of the Borough of Brooklyn.

ARC LIGHTING AT THE BEGINNING OF THE TWENTIETH CENTURY—II.

(Concluded.)

BY H. W. HILLMAN.

Again referring to your meeting two years ago, and the discussion on arc lighting, Mr. O. T. Crosby suggested that there was a large demand for an arc lamp which would produce a less volume of light than the regular standard lamps offered. That is, a demand existed for a low-current or low-energy arc lamp which would produce a fair volume of light, and so offer merchants a first-class illuminant at an attractively low price.

At that time considerable success had been reached, and many of the central stations had in use the so-called three and one-quarter-ampere direct-current lamp, having found that it was a strong competitor against Welsbach lighting, securing a class of trade which could not be reached by offering the regular high-energy lamps. The fact, however, that the direct-current lamp was satisfactory at a low current was not sufficient evidence that an alternating lamp consuming 280 to 300 watts at terminals would accomplish the work desired. It was thought the light would be insufficient. Tests at the factory, in the station and finally in actual store practice determined that even the alternating lamp, operating at four amperes and consuming a little less than 300 watts at terminals, was exceedingly satisfactory. The Buffalo General Electric Company has used these lamps during the past year, successfully meeting severe competition from 25-cent gas. Suffice to say that Mr. Crosby's suggestion has been fully met on low-energy lamps; both alternating and direct current being in operation in all parts of the country, and the best evidence of a specific case is shown in the illustration below, representing a large department store in Salem, where 104 alternating four-ampere lamps are in operation. Details are many in connection with this class of business, but time permits only the simple statement that at the beginning of this Twentieth Century the central station business is favored with still another strong competitor against Welsbach or other forms of illumination which will substantiate the claim that electricity still maintains the supremacy as the most modern and satisfactory method of securing artificial illumination.

The fact that the direct-current systems of street lighting have not been referred to freely in this paper is not due to any lack of appreciation for these systems of arc lighting. As the century opens it sees the interior and outside lamps for arc lighting fully met with well tried and thoroughly reliable systems; the multiple enclosed lamps for interior lighting; the series enclosed arcs for street lighting. Large-sized arc machines are successfully used, operating as many as 175 arc lamps. Approximately 50 cities and towns have adopted this method of street lighting, and wherever the direct-current light is used there is no question about the quality of illumination. No change from open to enclosed arc lamps has reflected greater credit upon central station management than that which took place at Boston under the most able management of the late Mr. Fred Gilbert. While the Boston Electric Lighting Company was a pioneer in this movement, it was not long before a great many large and representative stations, throughout New England especially, were equipped with direct-current enclosed arcs, strengthening their position in respect to the street lighting business. We therefore find to-day upwards of 20,000 direct-current enclosed arcs installed for street lighting, of which 15,000 are 480-watt lamps, consuming 6.6 amperes, and 5,000 350-watt, consuming 5 amperes.

The census bulletin from Washington, dated October 25, 1900, gives results of the twelfth census of the United States, showing 150 cities having a population of 25,000 or more in 1900. The introduction of enclosed arcs for street lighting has been so extensive and rapid that 51, or 33 per cent of the 150 cities mentioned, have permanently adopted them. This figure refers to those cities of 25,000 or more which have actually closed term contracts on the basis of enclosed arcs, which arcs have been installed as a system, and the subject is almost an old story. When considering those cities and central stations which are earnestly investigating the enclosed arc system for street lighting, practically 70 to 80 cities of 25,000 population or more could be included. This point is worthy of mention for the reason that there are a few isolated cases where open arcs are still specified by city authorities, who do not seem to realize that new street lighting contracts on the basis of open arc lamps are a thing of the past—not representative of modern street lighting practice.

To show also that large cities, as well as small, have taken energetic measures to secure enclosed arc street lighting, it is interesting to note that out of the 51 cities which have adopted the enclosed arcs and abandoned the open arcs, 26 of such cities are sufficiently large to show 50,000 population, while 10 of these have a population of 100,000 or more, in the census of 1900.

In closing, let us all appreciate the most essential point in connection with all arc lighting—interior as well as street service; namely, introduce new ideas, improve the service and educate the city authorities along the same lines that the merchants have been following. It gradually became the custom for merchants to use an increased number of lamps; lower-energy arcs were available, and, as prices for current were made more attractive, a wonderful increase in the use of arc lamps among the merchants has been the result.

The time is now come when activity is required in the matter of street lighting. It has been pointed out over and over again that open arc lighting was too brilliant; the demand is for a mild, well-diffused light, from a lamp consuming less energy and costing less money. The place to introduce low-energy lamps is in the new residential districts, in all the suburbs and localities where previous illumination has been by gas or oil lamps. Such new street lighting work requires a lamp which will permit of a competitive price, and yet afford a profit to the lighting company. Such a lamp as the four-ampere alternating, consuming only about 275 to 300 watts at terminals, would be a very strong competitor against other forms of artificial light usually offered for suburban streets.

It may not be news to many of the members present, but it is certainly most interesting to again refer to the report of the Committee on Lighting of the Board of Legislation of Cincinnati. This committee visited 12 of the largest cities in the country for the purpose of compiling data and information regarding best methods of street lighting, and the following quotation from their report should interest every central station man to secure a copy and read the entire report:

"The use of an increased number of lamps, giving the same amount of light more evenly distributed, would be an object well worth striving for."

In the essays of the eminent philosopher, Ralph Waldo Emerson, one finds that the reading of but a single sentence offers opportunity for thought. The above heading is filled with meaning, and should awaken central station managers into a line of thought and action.

First. It suggests the use of an increased number of lamps on the streets. This is greatly in the interests of the central station business; greatly in the interests of the cities and towns throughout the country.

Second. The sentence suggests that the increased number of lamps would give the same amount of light more evenly distributed. Here, again, we see the mutual advantage to the public, as well as the electric lighting company, because it not only means the liberal installation of lamps in new residential districts, the better lighting of alleys and side streets, heretofore dark, but it offers improvement in the art of electric arc street lighting.

At the beginning of the Twentieth Century, electric arc lighting is far in the advance in satisfactorily filling the demands for:

First. Department store illumination.

Second. Street illumination.

Third. Illumination for all classes of factories and mills.

THE CONSTRUCTION OF SMALL TELEPHONE EXCHANGES—XI.

BY A. E. DOBBS.

INSIDE TERMINAL CONNECTIONS.

So far we have only considered cable terminal connections at the outside end or ends. It is not a matter of a great deal of importance whether the outside end is connected to the terminal first, or whether the connection is made at the inside; it is merely a matter of convenience depending upon the condition of the work. If the cable, for example, should end at a single terminal outside, it does not matter which end is connected first, for it is just as easy to test from the outside in as it is from the inside out. If, however, it should be a divided cable, as shown in Figs. 27, 28, 29 and 30, then the matter takes on a different face and the cable should be connected up to the terminal numbers inside the terminal room first, as this is about the only way by which mistakes in picking up wires at the "A," "B," "C" and "D" boxes can be avoided.

As before explained, cable bought from the manufacturers is generally fully guaranteed and put through factory tests of the severest kind and the only trouble likely to arise may come from a punctured sheath or from careless handling of the cable as it is being pulled into place; therefore, if proper care is taken and the cable is carefully inspected as to defects in the lead covering as it comes off the reel, very few pairs will be lost; moreover, tests made before the cable is in place are apt to be misleading. The writer has seen as much as 50,000 feet of aerial cable put up at one time without the loss of more than a dozen pairs, and even some of these were afterwards found to be in trouble in the terminal connections. One of the most convenient pieces of apparatus for the quick testing of a cable, easily put together, is shown in Fig. 45. It consists of a box, which need be only large enough to hold two or three cells of dry battery, wired as shown, diagrammatically, in the figure. On the box are mounted six binding-screws, the ones marked L and G being connected to the line and cable sheath, respectively, or to the two wires of a pair. B B are the battery binding-posts, which should be so arranged that any desired number of cells—or even a generator—can be thrown in as needed. The two-point switch, S, is arranged to throw in either the battery or the telephone at the points, R and T. As a general thing a strong receiver is all that is needed for testing purposes, though a regular set may be connected in. In the battery circuit is placed a bell, or buzzer, which rings when the circuit is closed at the other end. There is also another circuit that may be added, as shown by the dotted lines to the point, S′, which may be a double-pole switch for cutting in a Wheatstone bridge for further testing if desired. The test proceeds as follows: First, the wires are all connected to the terminal at one end or the other, the white or blue wires being connected to the odd numbers, as 1, 3, 5, 7, etc., while the red wires of each pair are connected to the even numbers, as 2, 4, 6, 8, etc. The white or blue wire of each pair is often called the "tip" or "line" wire, because it is so arranged that it connects to the tip side of the switchboard plug jack and also, in a common-return system, it is the wire which is connected

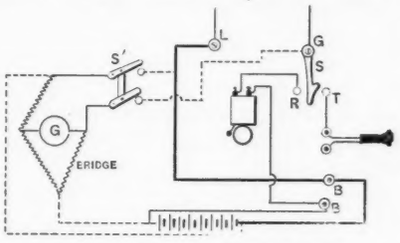


FIG. 45.—CIRCUIT TESTING DEVICE.

to the line while the red one, in that case, is connected to the common-return wire. For a similar reason, the red wire is usually named the "ground," or sleeve, which is likewise attached to the sleeve side of the jack and also the ground or common-return side of the line, if such is used.

This arrangement of the wires has been in use so long that it has all the force of an unwritten law and almost any lineman or cable man who knows his business will follow it. The plan should be religiously observed, for changing these colors will not only create confusion but if new linemen should be hired at any time they might waste a great deal of time trying to find out how the system was connected up. Remember: White to the tip and red to the sleeve while in the cable connections; white takes the odd, and red the even, numbers, counting each wire as one. Now, coming back to our subject again, we will require two men—one at each end of the cable—one with the test box described in Fig. 45 and the other with a good telephone receiver.

As said before, there are two methods of counting an outside cable—one by counting each wire as a separate line, and the other by counting them by pairs.

In the former, a 50-pair cable would, therefore, have 100 numbers, which would correspond to the pins outside, while in the latter there would be only 50 numbers to the 100 wires.

We will suppose that the latter method is adopted; the man with the test set connects one side of it to the sheath of the cable and the other to the "line" side of No. 1 pair at the terminal that has already been connected up. The other man, who is at the other end, has the wires already fanned out and his receiver attached to the cable sheath on one leg, while with the loose end of his receiver circuit he rapidly touches one after another of the loose ends of the cable conductors. When he has found the right one the fact is indicated by a loud buzz in the receiver and it is also indicated to the other man by a ring of his bell or buzzer. At this he throws his switch over, which connects the telephone, over which he now speaks to his coworker, already listening for instructions, and says "No. 1 line," which is repeated back. The other side of the pair is now found without the battery test and the telephone order of "No. 1 ground" is also repeated back. (The terms "line" and "ground" are more easily understood through a telephone than the words "tip" and "sleeve.")

The same formula is gone through with all the other pairs until that terminal is finished and all the wires at the second terminal attached to their tips, when a second test is made for crosses and grounds. For this purpose it is well to use a considerable voltage and 50 cells should be used, or, if sure that the outer ends are all clear, a 100-volt electric light supply is convenient, using two lamps in series to prevent a possible burnout. The free wire of the test set may now be rapidly touched to all the tips in turn to ascertain whether any of them is grounded on the cable sheath. Should they be found "clear" they may now be tested against each other. For this test disconnects the test set from the cable sheath and attaches it to the tip or line wire of No. 1 pair, while the free wire is touched to each of the other wires in turn. This process is repeated until every wire in the cable has been tested against all the others.

If the engineer in charge now desires galvanometer tests may be made, after which the wires may be soldered to their clips and the job completed. With the test set just described, two men are able to test and connect a 100-pair cable in 40 minutes. The set is therefore much quicker than the older method of testing with a magneto, which would not only require the two men, but also a helper to turn the

crank. Many men prefer to use a telephone for the final test for grounds and crosses, using it in place of the bell shown in Fig. 45, and connecting in about six cells of battery. In this method, in running down the clips with the free wire, if the cable is a long one, there will be a slight click in the receiver at the first touch, due to the static charge, but if the conductor is "clear" it will have become fully charged at the first touch and subsequent touching should produce no sound in the receiver. By some construction men this is the only method relied upon, as an experienced man will be able to tell the insulation resistance of the cable pretty well without any other test.

BLEACHING BY ELECTRICITY.

BY GEORGE E. WALSH.

Bleaching by electricity is not exactly a new method of obtaining results that chemistry has chiefly monopolized in all the industries; but the modern processes employed show sufficient change and improvement over the early ones that the work is practically the outcome of to-day's inventions. Electric bleaching combines the chemical method in it, for it is merely used as an agency to produce certain chemical actions. The process technically described is merely the decolorization of chlorides by electrolysis. The decolorization obtained in this way has been found to be more satisfactory than that obtained by purely chemical action.

One of the drawbacks to bleaching by electrolysis has been the cost. By the more common chemical method the cost was about one-half, and for this reason nearly all the trades and industries adopted it. Quite recently, however, a German chemist has introduced and patented a process of bleaching by electrolysis which, according to the claims set forth, makes it of great commercial value on account of its low cost. If this proves true modern bleaching methods will be completely revolutionized in all the trades, and electricity will become an agency of great moment in the cotton and cloth manufacturing.

In order to appreciate the German method of bleaching by electrolysis it will be interesting to glance at some of the stages of evolution through which this has passed. There have been for a long time three distinct methods of bleaching by electrolysis recognized by the trade, and while any one of these processes might have been satisfactory, not one could be generally adopted on account of the extreme cost. These processes are named after the chemists or inventors who discovered them, and are commonly spoken of as Hermite's, Brochoki's and Leclanche's methods. The Hermite process was one of the earliest, and it is described as a process in which the bleaching liquor is produced by the electrolytic decomposition of solutions of the chlorides of aluminum, calcium and magnesium. In this process preference is given to the latter, but there is no mention made in the description of the work of the use of any of the hypochlorites.

According to his own description Hermite gave a preference to chloride of magnesium because of the lower electro-motive force required to decompose it. As the question of economy was the all-important one, even then this was a consideration not to be lightly overlooked. Moreover, he set up the claim that the hypochlorite of magnesia had a more rapid and superior bleaching power than chloride of lime; but this advantage was partly offset by the high cost of chloride of magnesium. To equalize matters more effectively he used a solution of magnesium and sodium chlorides.

The decolorizing chlorides obtained by electrolysis have always proved to be more energetic and lasting than those developed by any chemical process, and it has always been understood that it was only a question of time before electricity would displace all other chemical methods. All that was needed was the discovery of some electrolytic method that would prove economical enough to make the work commercially profitable. In bleaching the higher priced goods, no expense is spared to obtain the best results, and the electrolytic process has been employed in a small way to some of the factories.

In Hermite's method the reactions produced in the process of bleaching were of unusual value, and the results obtained therefrom eminently satisfactory from any point of view except that of cost. In his process the oxygen, acting on the coloring principles, oxydized it with formation of carbonic acid. The chlorine produced hypochloric acid, which, combining with the magnesia, reforms the original magnesium chloride. In this way the loss is small, for the same chloride of magnesia can be used indefinitely, and nothing is actually lost in quantity except the saline solution which is retained by the bleached fabrics. This process is susceptible for further improvements, and some modifications of it have been adopted by experimental factories where high-priced fabrics have been bleached.

In the Brochoki's process the employment of platinum electrodes was a fatal handicap from the beginning, for the cost was at the outset so great that there was little possibility of its being adopted by any of the trades. There are, of course, some advantages. One is that the results are superior to any other, and the fabrics bleached show a really superior finish of unsurpassed value. The cost of this method, too, is larger in the initial or invested capital than in the actual work of bleaching. In this process the apparatus has five compartments, with lead used in connection with the platinum, and the electric current enters the first compartment near the platinum electrode, traverses the salt solution, electrolyses it and passes on to the leads.

In both of these processes the electrodes effect the formation of hypochlorates of soda, but it is not possible in either instance to obtain great chlorometric strength. For this reason neither process has been considered sufficiently satisfactory for general use, and inventors have since been trying to improve upon the methods without adding any extra cost. Leclanche's method attempted to remedy this by producing the same chlorometric strength as that obtained by the ordinary chemical method. His apparatus was constructed for this special purpose, and he succeeded in accomplishing the purpose to a relative degree. But the apparatus is too costly of structure and operation unless connected with an electrolytic plant already established. This method of bleaching can be made satisfactory from a commercial point of view only in large electric plants where the cost of the current is low, and where the bleaching is conducted on a large scale. In fact, the cost is rapidly decreased the larger the plant is made. For small mills and plants it can hardly be used with efficiency.

Processes of bleaching by electricity have advanced rapidly in recent years, and one method is superseded almost as soon as its completion is announced. This indicates that the improvements must soon reach a point where electric bleaching will supplant all other methods. Manufacturers are confident that electricity will be the future agent in this work. The announcement that a German chemist has discovered a cheap and effective apparatus for bleaching by electrolysis does not come as a surprise, but rather as a confirmation of views already entertained for years by those best informed on the history and literature of the subject. German chemists and bleachers have given more attention to this work than Americans, and most of the processes so far described are of German origin.

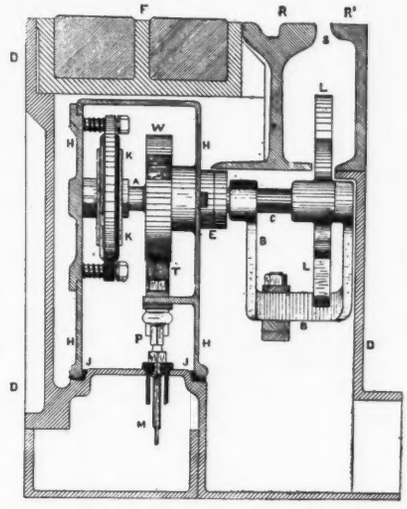
A BRITISH MECHANICAL SURFACE CONTACT RAILWAY SYSTEM.

BY A. WEBSTER.

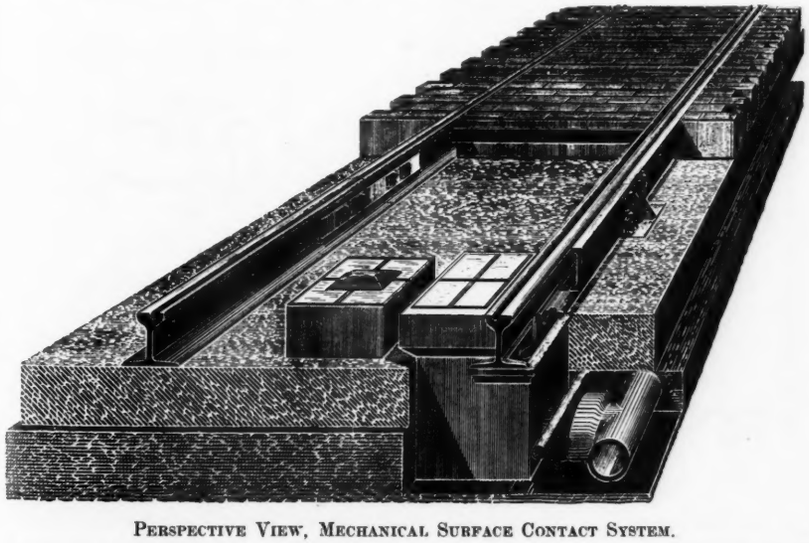
Although the overhead trolley system has been universally adopted in England wherever electric traction is employed, there are many who are anxious to see a thoroughly efficient reliable system invented which would, so to speak, strike a mean between this method and the underground conduit. This means, of course, a surface contact system insuring immunity from shock to anv one walking across the contact studs. Such a system, operated by electromagnetic switches, has been working in Paris for about four years, and there is nothing novel in the principle of collecting the current from studs placed in the roadway. The difference between one surface contact system and another is entirely in the method of operating the switches. In view of the fact that such systems are extremely scarce, I offer no apology for noticing a decidedly novel one which has received much attention at the hands of the engineering press in England.

The principal feature of it, which is known as the Kingsland mechanical surface contact system, is the employment of a revolving tappet-wheel operated by a striker-bar attached to the car. This wheel is placed in a slot formed in the roadway, as shown in the perspective view. The striker-bar on the car projecting downwards engages with the tappet-wheel giving it *one-sixth* of a turn every time the car passes. The tappet-wheel is connected with the electric switch and the current is switched on and off the studs as follows:

The diagram is a sectional end view of the switchbox, rails and tappet-wheel. R is one of the tram rails and R′ is the outside or slot rail. D is a cast-iron street box, having a removable cover, F, and contains the inner switchbox, H, and the tappet-wheel, L. The switchbox, H, is clamped by bolts and lugs and by unscrewing the latter, the box, H, with all its contents can be lifted out of the outer box, D, and the bracket, B, and tappet-wheel, L, are also equally accessible. The action of the switch will now be seen. The body of the commutator, W, is made of insulating material, but imbedded in this are three contact pieces joined together by a metal ring underneath. The two brushes, T, T, are so placed that in one position of the commutator they will both be in contact with the metal portion while in another they will both be insulated. It will thus readily be seen that as the tappet-wheel has six arms and is moved one-sixth of a revolution each time it is operated, there will be three "on" positions and three "off" positions during one complete revolution, which will occur alternately. M is the main cable. In order to prevent the tappet-wheel from revolving more than one-sixth of a revolution due to the heaviness of the blow, an automatic locking device has been patented, by which the shock of the blows is taken up by springs, one switch being ready for the next operation the moment after one blow has been dealt. An experimental line has been laid down at Wolverhampton and the system is receiving a deal of attention from experts. Two methods of working with this system are available. In one, the car only carries one striker, and the connection of the stud in advance is effected simultaneously with the disconnection of the rear stud by the action of one and the same switch. In the second method of working, two strikers on each car are used, the rear striker being utilized for the purpose of disconnection. Of course, one can see faults, but one thing seems certain, *viz.*, the studs are never "alive" until a car-striker turns the tappet-wheel.



SECTION OF STREET SWITCH-BOX FOR MECHANICAL SURFACE CONTACT SYSTEM.



PERSPECTIVE VIEW, MECHANICAL SURFACE CONTACT SYSTEM.

Electricity in Glass-Making.

The product, called "electroverre," according to the *Moniteur Scientifique,* is made as follows: The materials in fine powder are fed into an electric furnace in several compartments; in about 20 minutes a clear liquid glass is obtained, which can be run into molds or worked as usual. For the finer kinds of glass the compartments are placed over one another, as the refining takes place more quietly. Fifty volts are sufficient with the Becker furnace, and the current can be either alternating or continuous. It is claimed as an advantage that the furnace can be easily started or stopped within a short time, and that the expense of pots will be saved. The trials are being made by a company at Cologne.

New Electric Railroad in Russia.

Consul-General Guenther writes as follows, dated Frankfort, April 30, 1901:

"The first electric suburban railroad in Russia was opened for traffic this year. It connects the manufacturing city of Lodz, in Russian Poland, with the neighboring towns of Zgierz and Pabianice, and is 13½ miles in length. The Thomson-Houston motors used were furnished by the Russian Electricity Union. The road is owned by a company of Polish merchants and manufacturers, and was built at a cost of $560,000. The charter provides that the government shall receive a share of the profits, and shall have the right to purchase after 20 years; and that the road and all equipment shall become the property of the government at the expiration of 28 years."

SYNTONIC WIRELESS TELEGRAPHY.*

BY GUGLIELMO MARCONI.

The very rapid advances which have been made in the art of telegraphy through space, continue to attract much attention to this fascinating subject. What was stated yesterday to be impossible has now become possible, and what we regard as almost insurmountable difficulties may be removed in the immediate future.

The number of experimenters working in this field has increased, as many workers, who, some time ago, had little or no faith in the practical utility of wireless telegraphy have now changed their minds and are taking up the subject.

I believe it to be necessary before I proceed to deal with the subject to state

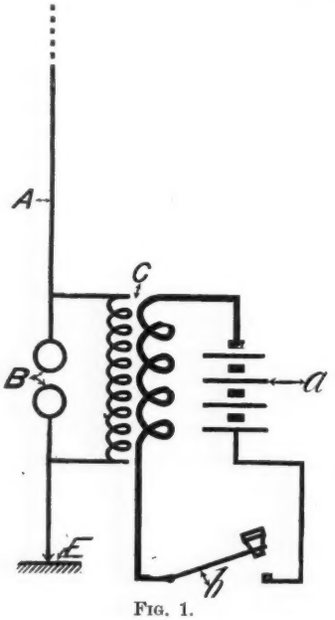


FIG. 1.

that in my opinion a large amount of inaccurate and misleading information is being from time to time published upon it in the daily and even in the scientific press. I shall endeavor to correct some of the misstatements which have been made.

As the title of my paper implies, it is my intention first to describe fully the efforts I have made in order to tune or syntonize the wireless system, efforts which, I am glad to say, have been crowned with complete success.

I also wish to mention something of the difficulties encountered in promptly publishing the results (whether successful or otherwise) obtained in the course of my experiments. A commercial concern, such as the one with which I am working, does not exist solely for the advancement of science, but especially for the purpose of securing a pecuniary return to those who have braved risks and undertaken sacrifices in assisting and forwarding the necessary experimental work.

It is often considered possible that certain new methods and results may, if

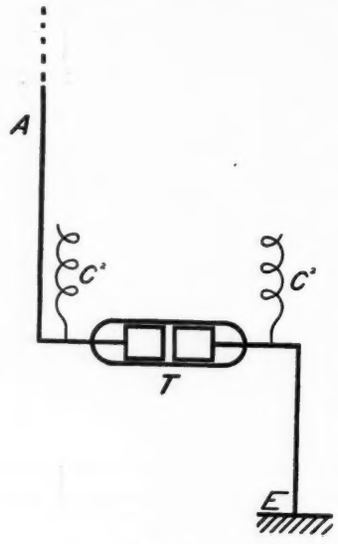


FIG. 2.

prematurely published before being fully patented, be utilized by persons whom I might call business rivals, thus preventing those who have borne the initial cost of the first tests from benefiting in a fair measure. I am, therefore, frequently prevented from promptly publishing the methods by which I have obtained interesting results. By quoting the dates of the British patent specifications and other

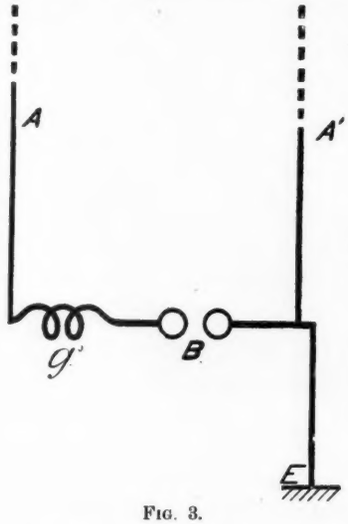


FIG. 3.

publications I hope to be able to establish, to a certain extent, the dates at which the various systems or methods were worked out. It may probably surprise some of you when I mention how comparatively long ago some of the patents which I shall discuss to-night were applied for and perfected.

Last winter I had the honor of describing before the Royal Institution of Great Britain most of the success obtained up to that date in communicating by means of my system from one place to another. It is my desire in this paper to give a description of the further progress made, with special reference to the results obtained by tuning or syntonizing the installations. So long as it was possible to work only two installations within what I may call their sphere of influence, a very important limit to the practical utilization of the system was imposed. With simple vertical wires, as shown in Fig. 1A and Fig. 2, connected directly to the coherer and spark-gap at the receiver and transmitter, as used by myself before 1898, no really satisfactory tuning was possible. It

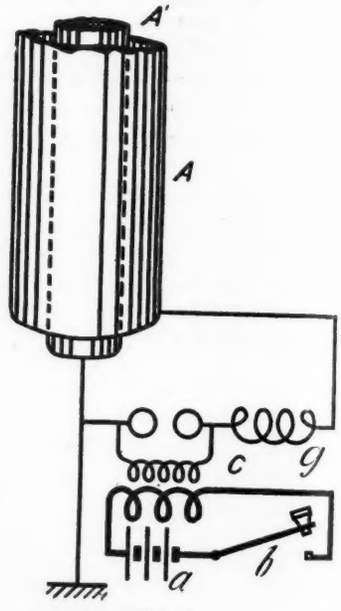


FIG. 4.

was, however, possible to obtain a certain selection of signals if various stations in the vicinity used vertical wires differing very considerably in length. Thus two stations communicating over a distance of, say, five miles, and using wires 100 feet long, would not interfere with the signals transmitted by the other two stations, say, two miles from the first, which were using aerials only 20 feet long, and communicating over a distance of about one mile.

The new methods of connection which I adopted in 1898, *i. e.* (see Fig. 8), connecting the receiving aerial directly to earth instead of to the coherer, and by the introduction of a proper form of oscillation transformer in conjunction with a condenser so as to form a resonator tuned to respond best to waves given out by a

*A paper read before the Society of Arts, London, May 15, 1901. Concluded next week.

given length of aerial wire, were important steps in the right direction.

I referred extensively to this improvement in the discourse delivered before the Royal Institution on February 2, 1900, and my first British patent specification referring thereto was applied for on June 1, 1898, No. 12,326, and published in due course. This mode of connection was also discussed by the technical press.*

It is remarkable that eminent scientists and engineers, such as Professor Slaby and G. Kapp, who have been good enough to discuss my work on "Wireless Telegraphy," should be so badly informed on the subject in general as not to know that this method, and many other improvements on my original system, have been in use by myself and my assistants for several years.

I wish to give you an illustration of what I mean. In a paper on "Tuned or Multiple Wireless Telegraphy," by Professor Slaby, of Charlottenburg, read on December 22, 1900, and published in a special number of the *Elektrotechnischen Zeitschrift,* he stated: "Up to the present the following method has been followed without exception. The receiving wire was *suspended insulated and attached at the lower end to the coherer,* the other pole of which was connected to earth."

Again, G. Kapp, in an editorial review in the same publication, states: "According

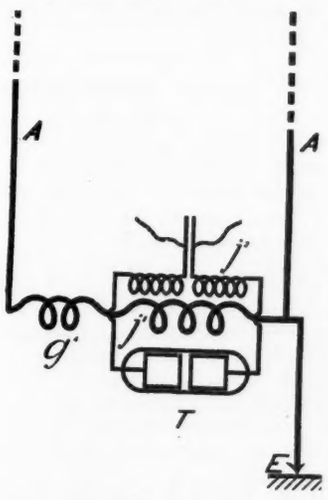


FIG. 5.

to the Slaby-d'Arco system and *in opposition to the Marconi system the receiving wire is earthed.*"

The inaccuracy of these statements is very apparent if we compare them with the description given by myself nearly three years previously in the British patent applied for, as I have remarked, on June 1, 1898, published in July, 1899, and openly discussed by the scientific press of this and other countries a long time previous to the date of Slaby's paper. At line 7, page 1, of my description will be found the following passage: "Accord-

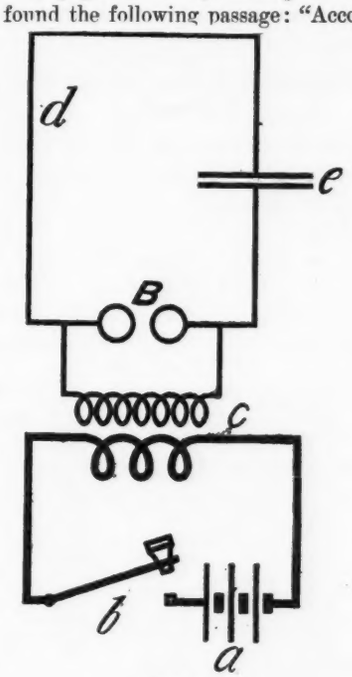


FIG. 6.

ing to this invention the conductor (aerial) *is no longer insulated, but is connected to earth* through the primary of an induction coil, while the ends of the imperfect contact (or coherer) are connected

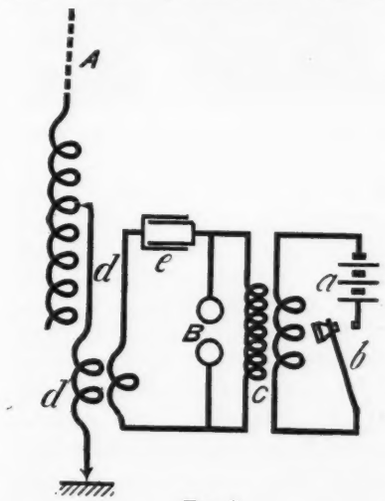


FIG. 7.

to the ends of the secondary one of the connections passing through a condenser."

As you will notice, nothing is said in this patent of the necessity of insulating the vertical wire of the receiver. If the system described here had not been used by me, I very much doubt whether we should have succeeded in maintaining communication with the East Goodwin lightship during 1899, in maintaining communication across the English Channel that same year during the meeting of the British Association at Dover, and in supplying the Admiralty in the course of the year 1900 with 32 installations, all of which passed an official 100-kilometre test (most of the distance being overland) at the rate of about three installations per week.

Leaving this subject for the present, I shall endeavor to describe the various steps made in the development of my syntonic system. I realized a long time ago that one great difficulty in achieving the desired effect was caused by the action of the transmitting wire. A simple, straight rod in which electrical oscillations are set up forms, as is well known, a very good radiator of electrical waves. If this was, in the beginning, an advantage, by allowing signals to be received with a small amount of energy over considerable distances, it proved later to be one of the chief obstacles in the way of obtaining good resonance in the receiver. Now, as Dr. Fleming points out so clearly in his Cantor lectures on "Electrical Oscillations and Electric Waves," delivered before this society in November and December of last year, there is in connection with this part of the subject one point of great interest. "Both theoretical and experimental research show that in the case of conductors of a certain form the electric oscillations die away with great rapidity." In all

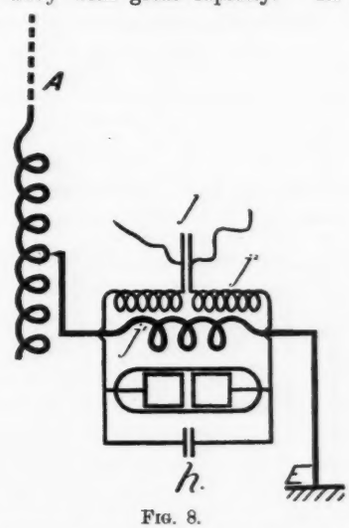


FIG. 8.

what we call good radiators, electrical oscillations set up by the ordinary spark discharge method cease, or are damped out very rapidly, not necessarily by resistance, but by electrical radiation removing the energy in the form of electric waves.

Many mechanical analogies can be quoted which will point out the necessity of designing a persistent oscillator, in order that syntony may become apparent in properly tuned resonators. Acoustics fur-

*See the *Electrician*, vol. xliii, p. 48; also vol. xliv, p. 555-556.

nish us with numerous examples of this fact, such as the resonance effects produced by the well-known tuning-fork experiment. Other illustrations of this principle may be given, *e. g.*, if we have to set in motion a heavy pendulum by means of small thrusts or impulses, these must be timed to the period of oscillation of the pendulum, since otherwise its oscillations will not acquire any perceptible amplitude. An illustration of this fact occurred to me some time ago while I was watching the ringing of great bells in an Italian cathedral. As most of you probably know, the bells in many churches in Italy as elsewhere are rung from the bottom of the tower by means of ropes attached to the bells. The largest bells weigh several tons, and it usually requires two men to work for perhaps two minutes on the ropes before the combined effect of their pulls is sufficient to get the bell to attain an amplitude large enough to cause the hammers to strike. I observed on the occasion to which I allude that it required for each bell a number of well-timed pulls on the bells in order to get them to swing, the larger bells requiring impulses further apart, *i. e.*, of a lower frequency, than the smaller ones. It is perfectly obvious that if the pulls on the ropes had been wrongly timed it would have been impossible with the same amount of power to ring the bells. The same kind of effect happens in a very small fraction of a second (instead of several minutes) when we try to induce electrical oscillations in a good resonator. If the form of this resonator be such as to cause it to be a persistent vibrator, *i. e.*, one in which the electrical oscillations are not rapidly damped by resistance or radiation of waves, then it is necessary for us to employ a number of properly timed electrical oscillations radiated from a persistent oscillator tuned to the period of the resonator we desire to affect.

Call for $5,000,000 by Central Union Telephone Company.

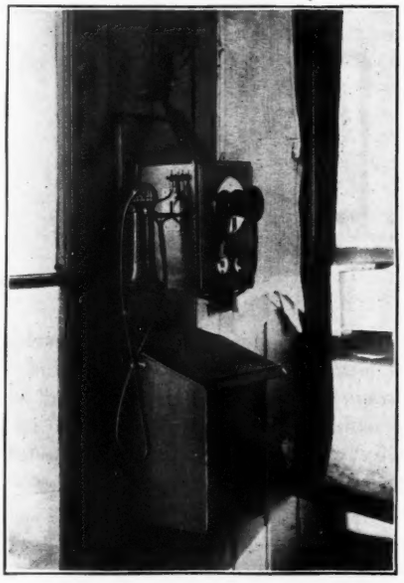
President John I. Sabin, of the Central Union Telephone Company, Chicago, has issued a circular to stockholders announcing that $5,000,000 is needed by the company. They are asked to pay an assessment of $60 a share as one of the ways out of the present situation. In his circular Mr. Sabin says:

"After two months' investigation—the last month in charge as president—I find that it is imperatively necessary that at least $3,000,000 be provided without delay—that is, one-half immediately and one-half before the close of the present year—with a call for another $1,000,000 during the first half of 1902, and one more for the same amount in the last half of 1902. This in addition to the net income during the period named."

On the assessment becoming known Monday of this week, the stock of the company declined nearly 10 points, closing the day at 40. The new money is required to supply the demand for service in the company's widely extended territory and to meet the opposition of other companies.

Telephone Signaling on the Erie Railroad.

In the ELECTRICAL REVIEW for May 11, 1901, Mr. F. L. Blendinger, superintendent of telegraphs of the Erie Railroad Company, described in a brief note the use of the telephone for signaling purposes as an adjunct to the telephone system of that railway. Mr. Blendinger has sent the photograph which is reproduced herewith



TELEPHONE IN BLOCK SIGNAL HOUSE, ERIE RAILROAD.

of the interior of a block signal house located at County Road Crossing, about three miles west of the Bergen Tunnel, on the main line of the Erie Railroad. From this point block signal circuits connect with the tower at Midland Crossing on the east and Hackensack Bridge on the west. The two signal circuits are carried to the transmitter box of the telephone and passed through a pin and spring similar to those in the old-fashioned telegraph plug cutout. The circuit remains closed through the spring and pin. There is no bell on the telephone, as a special telephone signal included in the block-signal bell code renders this unnecessary. Upon the sounding of the telephone signal the operator inserts in the east or west plug hole, as the case may be, the plug at the end of the cord which is shown hanging over the transmitter box, and the telephone is then in the signal circuit ready for use. Upon the termination of the conversation the plug is pulled out, when the signal circuit closes at once through the spring and pin.

The New York Electrical Society.

The annual meeting of the New York Electrical Society was held on Wednesday evening, June 5, at the College of the City of New York, the following officers being elected: President, Arthur Williams; vice-presidents, C. O. Baker, Jr., C. E. Knox, S. L. Nicholson, H. A. Lardner, G. H. Condict, H. V. Parsell; secretary, George H. Guy, and H. A. Sinclair, treasurer.

The Railway Telegraph Superintendents.

The annual meeting of the Association of Railway Telegraph Superintendents, Mr. P. W. Drew, of Milwaukee, secretary, will be held at Buffalo, N. Y., June 19 and 20. The headquarters of the convention will be at Statler's Pan-American Hotel.

The place of meeting was changed from Boston to Buffalo this year on account of the desire of many of the members to attend the exposition at the latter city.

The Northwestern Electrical Association.

The summer meeting of the Northwestern Electrical Association will be held at Sheboygan, Wis., commencing Wednesday morning, June 26. Reports and papers on a number of subjects of special interest to central station men will be read and discussed. An attractive entertainment programme is being arranged, and it is believed that all who attend the convention will be assured of a pleasant and profitable time. Full information may be obtained of Mr. Thomas R. Mercein, the secretary and treasurer of the association, whose address is 85 Michigan street, Milwaukee, Wis.

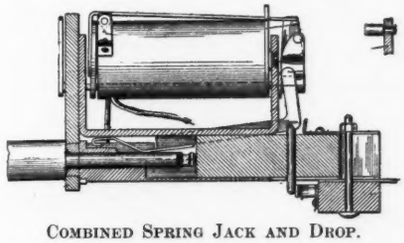
A New Type of Storage Battery.

The new and perfected form of accumulator, known as the "Exide" cell, manufactured by the Electric Storage Battery Company, of Philadelphia, has lately been selected for service on the new automobile omnibus line for Fifth avenue, New York, as well as for the general service. This line will be operated by the New York Electric Vehicle Transportation Company, which has been running the electric cab service in New York for several years past. The new battery has been tested in service upon these public automobiles, and it is claimed that excellent results have been obtained.

The battery, whose design is largely due to Mr. Justus B. Entz, the company's chief engineer, has been evolved from the old style lead plate accumulator. The battery is stated to weigh 62 pounds per effective horse-power-hour output, and to have lasted out over 2,500 miles of actual service in the public automobiles. In comparing this battery with other light types recently described, Mr. Entz is quoted as saying that this cell, which has been operated with an output of one horse-power for 50 pounds weight of complete elements, is actually lighter than the claims which have been made for some recent inventions.

Electrical Patents

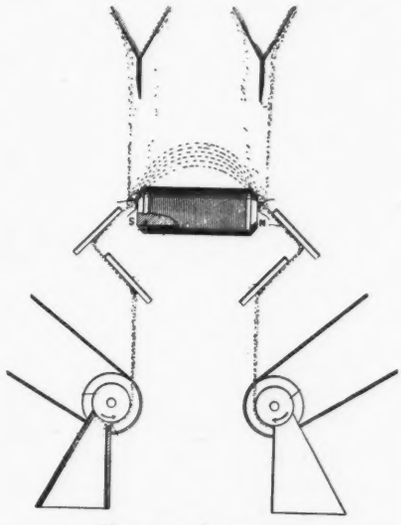
Mr. Isidor J. Kusel has recently patented an improved combined spring jack and drop for telephone switchboards, the patent having been assigned to the Eureka Electric Company, Chicago. The object of this invention is to produce a combined spring jack and drop which is compact in form, strong and simple in construction and easily attached to or removed from the board. In this instrument electrical connections between the lines of the board and those of the jack and drop are made or broken by attaching or detaching it, and the action of the magnetic coil is strengthened by a tubular shell of magnetic metal. The annunciator plate falls sidewise, in a



COMBINED SPRING JACK AND DROP.

plane parallel to the face of the board, and this plate is automatically restored to its position by the insertion of a plug into the jack. The jack is not liable to accidental displacement by jarring of the switchboard. A night-bell circuit, normally open, is arranged to be closed by the falling of the annunciator plate. Connections for this and for the subscribers' lines are permanently secured to contact points on the stationary portion of the switchboard, these being arranged to engage corresponding contact points on the jack and drop, so that mechanically attaching the jack to the switchboard performs the electrical connection. The tubular shell of soft iron surrounding the electromagnet prevents cross-talk.

Mr. Thomas A. Edison has been improving his magnetic separators and has recently patented a new feature. He provides a magnet which has a minimum length between the poles and a maximum length at right angles thereto. In other words, the core consists of a soft iron bar having a length of four feet six inches, a width of one foot and a thickness of three inches. The magnetizing core is wound lengthwise over the ends of this bar, leaving exposed for the polar faces the side edges. This magnet is arranged with its greatest length in a horizontal plane and it is supported by legs on suitable beams or blocks. Above each end is a hopper having an oblong bottom from which the ore is fed by means of a roller in a thin sheet. Between the hopper and the magnet are interposed inclined guideways or boards which arrest the fall of the material, so that as it passes the magnet its movement



MAGNETIC SEPARATOR.

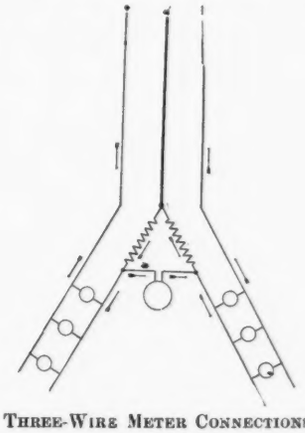
is comparatively slow. To decrease the speed further, brass angle brackets are secured along the side edges of the magnet, and the guide boards are arranged so that the material is projected against these metallic strips. The operation will be obvious. The ore is fed in a thin sheet and projected against the opposite ends of the magnet. The non-magnetic portions will fall into one receptacle, while the magnetic particles will be drawn out of this path and fall into another receptacle.

A very simple push-button, embodying several important features, has been patented by Mr. Sigmund Bower, of Brooklyn, N. Y. In the present instance the casing is made in the usual form, compris-

NEW PUSH-BUTTON.

ing a base, to which is screwed or otherwise detachably secured a shell having an opening through which the button projects. This button, however, instead of being loosely mounted in the opening, is secured to a contact spring, one end of which is fastened to the base, while the other end is free and is arranged to contact with a suitable plate also fastened to the base. By this construction, there is no danger of the button being lost when the case is open, and, as the contact spring has a sliding engagement over the plate, the surfaces are kept clean and bright.

Mr. John R. Dick, residing at Brighton, England, has patented in this country apparatus for connecting electric meters in three-wire circuit. The patent has been assigned to the Mutual Electric Trust, Limited, of England. The object of the invention is to do away with the necessity of connecting up a recording instrument in each of the two outside wires and adding together the readings of these instruments to arrive at the maximum demands of the whole installation. In certain instances it is well known that the demand on the positive and on the negative sides of a three-wire circuit are not coincident, in which case the readings will not be ac-

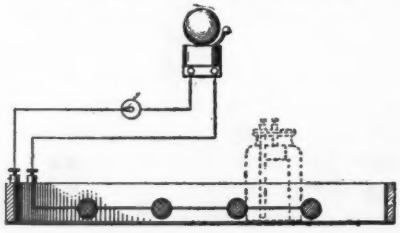


THREE-WIRE METER CONNECTIONS.

curate. By the present arrangement, the inventor claims that accurate readings are obtained without the employment of two separate instruments. To this end the neutral main is split into two leads, one of which is associated with the positive main, and the other of which is associated with the negative main. A Wright indicator is connected across these two branches by means of suitable wires and between the points of connection of said wires and the point where the neutral main divides two equal resistances are inserted. The action of this resistance is to cause a determinate portion of each of the two currents to pass through the instrument, so that the indication of the instrument is always proportional to the sum of the two currents. The resistances should be comparatively small so as not to cause an undue drop in the voltage.

An ingenious device for notifying a person of the breakage of a cell in an electric battery has been devised and patented by Mr. James R. Blackwell, of New York city. As is well known, batteries employed in dwelling houses and similar places are generally placed in such a position as to be hidden from general view, and it often happens that the working of the apparatus having connection with the battery is interfered with or deranged by the breaking of one of the cells. The present invention is designed to automatically notify a person of the same. To this end, a tray is provided in which the cells

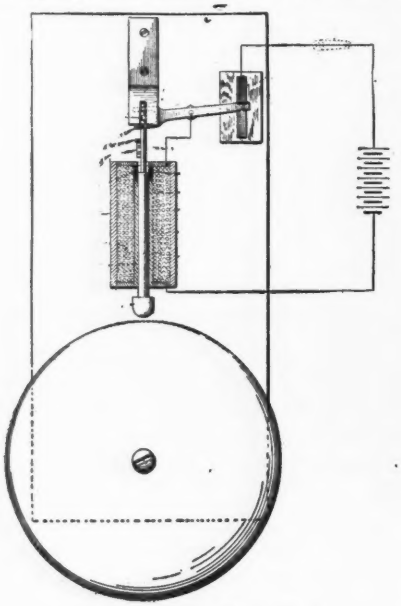
are placed and connected up in the usual manner. The tray comprises a wooden frame having a zinc bottom, and located



Battery Tray.

a slight distance above the bottom, but insulated therefrom are a number of carbon sticks. These carbon sticks are electrically connected with a binding-post and another post is in like manner secured to the zinc bottom. From the binding-post, wires lead to an alarm device, preferably in the form of an ordinary bell. By this construction it will be seen that should one of the cells become broken, the exciting fluid will flow into the tray, said tray being thereby formed into a battery, so that when the liquid comes into contact with the carbon and zinc, a current will be generated that will flow through the wires that connect therewith and ring the bell.

The Sargent Automatic Railway Signal Company, of Rochester, N. Y., controls a



Electric Bell Mechanism.

recently issued patent granted to Mr. Walter E. Foster, of Carnegie, Pa., on an electric gong intended more particularly for use at railway crossings, although, of course, it may be employed in other connections. A base is provided to which is secured a gong or bell, and above said gong or bell is located a vertical solenoid coil having a reciprocating core that is provided at its lower end with a head arranged to strike against the gong. The upper end of this core projects above the solenoid, and a lever is pivoted intermediate, its ends above the solenoid. One end of the lever is forked and located against the projecting end of the core, a pin carried by the core being arranged between the fork arms. The other end of the lever detachably engages a flat spring that is located in a suitable battery circuit, in which the solenoid is also placed, the lever thus forming a part of the circuit. This circuit is arranged to be operated by a train approaching the crossing at which the bell is located. When the circuit is closed, the core is immediately drawn up, and as it reaches its upper position it throws the lever out of contact with the plate. This breaks the circuit, and the core and hammer fall by their own weight upon the bell. In falling, the pin carried by the solenoid engages the lower fork of the lever and again throws it into contact with the plate. The circuit is again closed, and the hammer or solenoid consequently raised. In order to immediately raise the hammer out of contact with the gong, a suitable spring is arranged to engage said solenoid as it reaches its lowest position against the gong and immediately raise it slightly. The advantage of the construction thus set forth resides in the fact that the gong will ring as loudly with a weak current as with a strong one.

The Dawson City (Y. T.) Telephone Exchange.

The telephone has made its way to the remotest corners and quarters of the globe, and in the capital of the Klondike district, Dawson, the mushroom city which has grown up on the banks of the Yukon River, and nearer the Arctic circle than any other place of equal importance in the world, there is a full-fledged and well-equipped modern telephone exchange. The accompanying illustrations give some idea of the character of the exchange itself and of the overhead work employed in the inhospitable climate of that country.

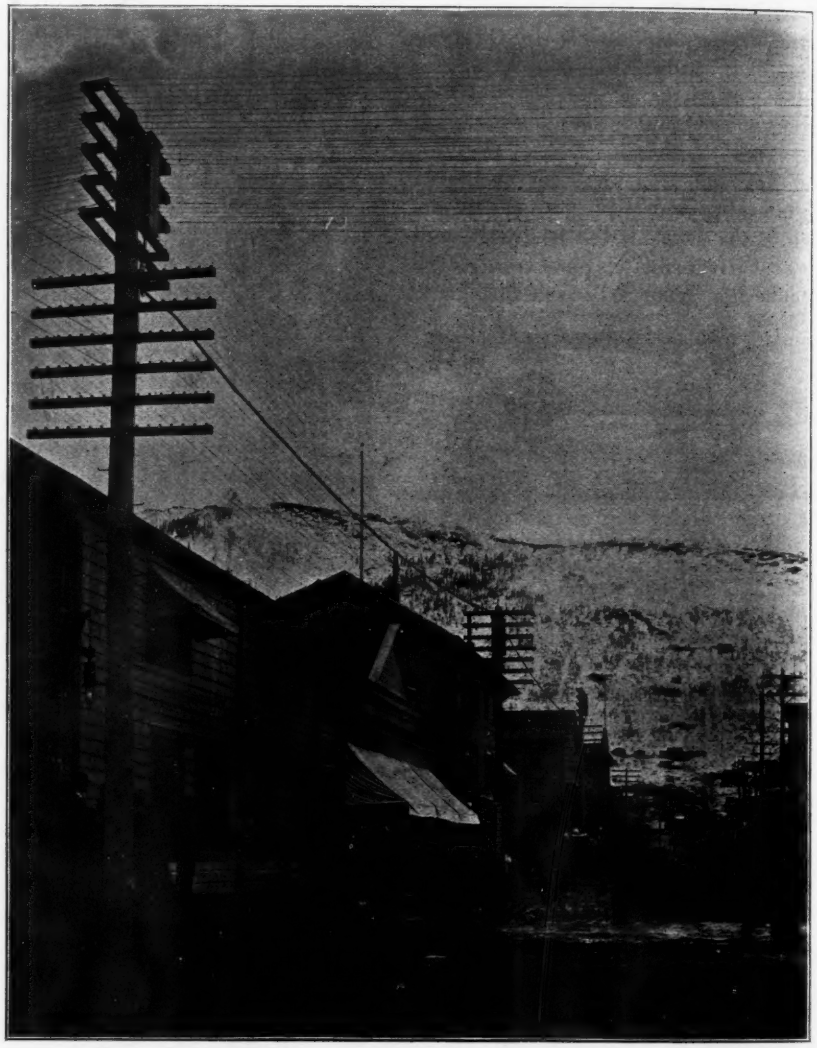


Fig. 1.—Main Street in Dawson (Y. T.), Showing Telephone Exchange and Method of Line Construction.

In the exchange building are installed four 50-drop switchboards, giving a combined total capacity of 200 drops. At present two more sections are under installation, which, when completed, will give this exchange a capacity of 300 subscribers. In the illustration, Fig. 2, showing the back of the switchboard and the distributing cross-connections, will be noted an instance of what sometimes has

to be done when constructing engineers are very far from the source of supply. One of the cables was too short to bring down into the casing with the other three, and, perforce, had to be "fanned out" across the top of the board in the way shown. Each of these four cables carries 104 wires, leading the circuits out to nearby cable poles, as shown in Fig. 1. It may be remarked here that the telephone office (which is so small as to be hidden by the awning of the next building) is situated between the largest mercantile building and the largest office building in the town of Dawson.

Four women operators are employed on the switchboards. At present the entire capacity of the exchange is in use in Dawson. The operating company, the Yukon Telephone Syndicate, Ltd., also has an exchange at Grand Forks, which is situated at the junction of Eldorado and Bonanza creeks, 14 miles away. Between this point and Dawson three full metallic circuits are maintained and two way-circuits also. The installation at the Forks comprises 54 telephones. Beyond this point two metallic circuits continue to Dome, 30 miles from Dawson, where is installed a combination switchboard with full metallic and ground return circuits, and upon this two operators are employed during the 24 hours of each day. It must not be forgotten in connection with this far northern installation that the 24 hours of the day are sometimes all daylight, and at other times all night. Beyond Dome a ground-return line extends 12 miles further to Hunker Creek, while the company also maintains a 13-mile ground-return line to Dominion Creek, and a similar line 35 miles long to Gold Run. Thence the line extends to Sulphur, 8 miles, and also to Quartz Creek. These lines radiate from Dome like the fingers of a hand. At all of the various camps mentioned the telephones are pay stations. It is expected this summer to put in metallic returns on all of these lines and to put in two more through circuits.

The company's equipment throughout is the standard apparatus of the Canadian Bell Telephone Company, the lines being built of No. 12 copper wire, on wooden poles. In the central office at Dawson, a one-quarter-horse-power, single-phase, 60-cycle motor is employed to operate the bell-ringing generators, and it is claimed that the service at Dawson is very fine. With the increased construction and improvements this season Dawson will have a telephone system second to none. The exchange at Dawson, as well as the various subsidiary lines and exchanges controlled by the Yukon Telephone Syndicate, Ltd., are under the general management of Mr. Donald B. Olson, to whose courtesy we are indebted for the information given above.

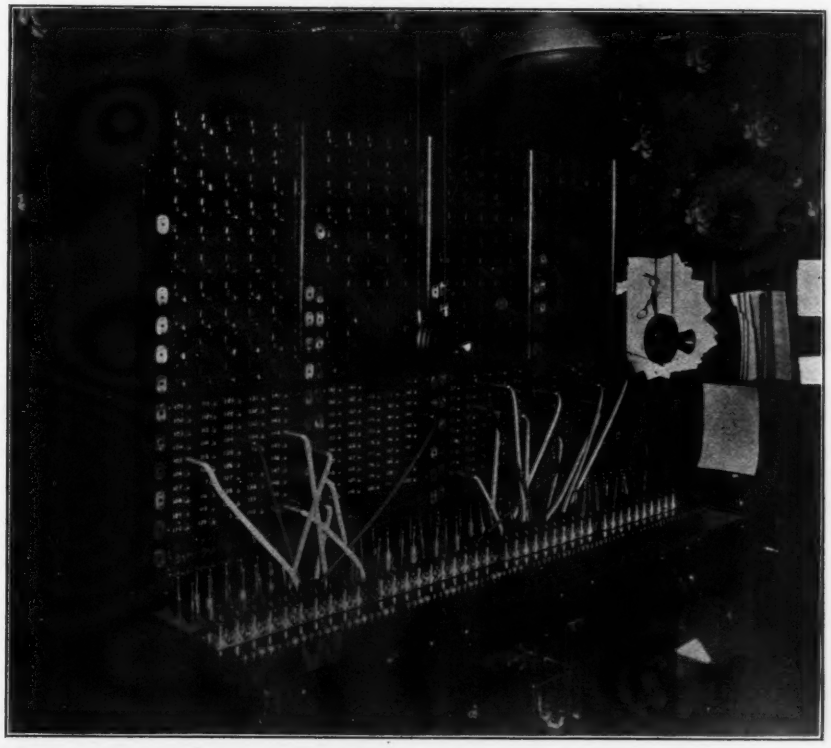


FIG. 3.—THE SWITCHBOARD IN THE DAWSON TELEPHONE EXCHANGE.

FIG. 2.—THE BACK OF THE DAWSON SWITCHBOARD.

The Detroit & Pontiac Electric Railway Sold.

Reports from Detroit, Mich., state that the first step in the consolidation of the local suburban railways, aside from the purchase of the Detroit & Northwestern, which awaits ratification by the stockholders, and the absorption of the Wyandotte & Detroit River Railway, is reported to have been made recently by the purchase of the Detroit & Pontiac line, of which Mr. Strathearn Hendrie is principal owner.

An Interesting Storage Battery Installation.

The illustrations show two views of an installation using Willard storage batteries. These batteries have been in use nearly three years.

FIG. 1.—STORAGE BATTERY INSTALLATION AT WILMINGTON, DEL.

The Willard plate is of the Planté type, having a large surface in contact with the electrolyte. It is made of pure rolled lead, and is said, owing to its peculiar mechanical construction, to be free from local action and premature disintegration. This plate is so constructed that buckling is claimed to be prevented entirely, owing to the leaves or ribs and the pockets between them, having an upward inclination of about 20 degrees.

It is a well-known fact that the positive plate, in practice, is constantly on the increase as regards its active material; that is, the active material in an old plate, or a plate that has been in use for some time, occupies more space than in one that has not been put to use.

In the construction of a plate this increase must be provided for. If it is not buckling and bending will ensue. This difficulty is ingeniously met in the Willard plate by the construction given above. As the active material expands and occupies more space the leaves tend to take a position perpendicular to the surface of the plate. This increases the space between the leaves, which allows for the increase of active material.

The battery shown in the two engravings, illustrating the Wilmington installation, has been in constant use for nearly three years. The battery consists of 144 cells in lead-lined tanks, the tanks being insulated from each other and from the ground by large double-petticoat porcelain insulators. The original capacity of the battery, as guaranteed by the manufacturers, was 2,250 ampere-hours when discharged at the normal rate. After nearly three years' use it is stated that the battery still gives in excess of this capacity. It is used every day to assist in carrying the peak of a station's load, being charged during the interval of light load.

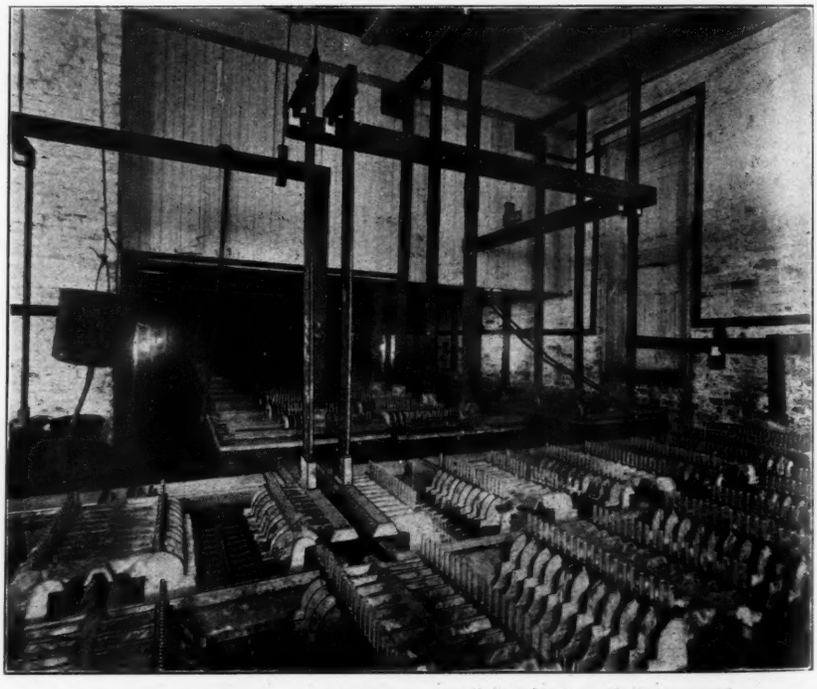


FIG. 2.—END-CELL CONNECTIONS, WILMINGTON BATTERY INSTALLATION.

The illustrations show the end-cell connections, which consist of heavy copper bars, parts of which are embedded in the lead bus-bars, to which are attached the plates.

Messrs. Sipe & Sigler, of Cleveland, Ohio, the manufacturers of the Willard battery, are now engaged in installing five batteries for the government, to be placed at different points along the coast.

Electric Phenomena of Chromium.

Some interesting and valuable experiments have been made by M. Jules Micheli, and described in the archives of the Physical Society of Geneva. He has discovered that the passive state of chromium is not due to the formation of a layer of oxide on the surface of the metal, and by an optical method has discovered that no such layer is formed. Nevertheless, when immersed in fused zinc chloride the metal is said to be rendered more active, although then the layer of oxide can be detected. Subsequent immersion in nitric acid again puts the metal in the passive state without removing the oxide. As the metal, when passive, ranks near platinum in the electro-motive-force series, and when active stands near zinc, it is suggested that the two states might be used as the basis of a battery. The author, however, finds contrary to the accepted opinion, that the passive form, when exposed to air, gradually loses its condition of passivity. He attributes these phenomena to allotropic modifications similar to those which have been noticed in other metals.

The Independent Telephone Convention.

Fifth Annual Gathering of the Members of the Independent Telephone Association of the United States of America, at Buffalo, N. Y., June 11, 12 and 13, 1901.

BUFFALO is preeminently the convention city this summer. With the Pan-American Exposition as a permanent attraction just outside its gates, and Niagara Falls, that perennial watering place and Mecca of the good electrician, near-by, it offers attractions of the most interesting variety. In consequence, partly, of this, and also because the art of independent telephony is rapidly assuming the proportions of a very large industry, and no little because interest in it is now at its highest point, the convention of the Independent Telephone Association of the United States of America, just held in that city, was the best attended and most successful, as well as the most interesting, in the history of that body.

TUESDAY, JUNE 11.

The first session was called to order at noon, Judge James M. Thomas, president of the association, in the chair.

The Hon. Conrad Diehl, Mayor of Buffalo, welcomed the convention to his city in a very felicitous address. He said, in part:

"On behalf of Buffalo I extend to you a hearty welcome. I feel the importance of the business that brings you—that 'competition is the life of trade.' But, with you, I believe that competition is even more. Betterment of service must follow your meetings and your efforts, and, as the telephone is almost as necessary as the food we live on, your efforts make for the general good of mankind."

The Mayor invited the convention to attend the Pan-American and to see what electricity has done for the commercial interests of Buffalo. He spoke of the beauties and attractions of the city and the part that natural force, entrained by electricity, was playing in its growth. He thanked the convention for the opportunity given him to address it, and extended to the members the freedom of the city.

A facetious interchange of pleasantries followed, and the president extended the thanks of the convention to the Mayor for his cordial welcome.

The president then read his annual address, as follows:

THE PRESIDENT'S ADDRESS.

The past year has been one fraught with important events in the telephone world, and the great work that has been accomplished is the highest commendation that can be offered to the great army of workers in the field. Having been in close touch with all the great independent organizations of the country and knowing their present status, I do not hesitate to say that all doubt of the permanency of the independent telephone movement has passed. Doubters have become its advocates, while the voice of the false prophet is no longer heard in the land, and his writings have been placed in the archives of oblivion bearing the inscription above its portals, "Failure."

The work in the Middle West, North and South, the greatest fields of activity in telephone development, is to be followed by very active development in the extreme eastern and western sections of the United States, and in a short time the organizations, now nearing perfection in those sections, will show a development that will be highly gratifying to those of us who for several years have labored in the fields now more fully developed.

In speaking of the conventions held by this organization, I have heard several gentlemen who have attended them say that the general tone resembles more political conventions than conventions of allied business interests. I have always agreed with that statement with a limitation, that they have been somewhat as political conventions would be with the politics eliminated. Like public conventions, we have never lost sight of the principles of progress and fair dealing with the people and, being so different from the meetings of the men who control the Bell companies, this impression has found lodgment in some minds. But this spirit, being the surest sign of the fundamental principles of progress, we desire that it shall always be the key-note of all conventions of the organization.

There has been much inquiry, not only on the part of those who have control of this field of investment, but also by those desiring to enter, as to the underlying principles that actuate the development of this movement. To fully and properly answer that inquiry requires a careful study of the entire history of telephony, and would require more time than those of us who are actually engaged in construction and operation have been able to give to the subject; but a glance over certain events and certain policies will be of interest and profit to persons seeking the knowledge desired by the prudent man before investing in the building of telephone properties.

The telephone being one of the greatest utilities discovered and put into practical use by man, and being entirely new, and the only means of reproducing articulate speech at a distant point, gave the inventors a right to protection for 17 years under the United States statutes, which rights the inventors could keep or sell to others if they so desired.

Bell's invention, the first put into practical use, and which at one time was a useful and satisfactory transmitter, being what we generally term a magneto telephone, gave place to a more effective instrument, the product of the minds of several inventors, but brought into perfection by that great inventor, Thomas A. Edison, who discovered the fact that carbon electrodes held in constant contact—but so arranged as to admit of variable pressure in conformity with sound waves, the result of articulate speech, thus regulating the flow of an electric current through them produced by a battery in connection therewith—gave a fuller and more perfect transmitter than Bell's invention.

After this discovery Bell's invention was fast supplanted as a transmitter by the more effective microphone, but its use as a receiver in connection with the microphone has been universal. For the purposes of this investigation the great volumes of records and briefs in litigation between inventors, or their assigns, will be of very little service and, therefore, we pass to such facts as will enable us to more fully understand the history leading up to the beginning of the independent telephone movement.

The first or fundamental Bell patent expired in March, 1893, and the second Bell or magneto telephone patent expired in January, 1894; and between these dates we find the work of establishing independent systems began. November 17, 1891, the Berliner patent was issued on an application filed June 4, 1877. The claims of this patent were intended to be broad enough to cover all constant-contact battery transmitters, and these were believed to be all battery transmitters of commercial value.

In May, 1893, the Edison carbon transmitter patent was issued on an application also filed in the year 1877, and it should be remembered that both the Berliner and Edison patents were owned by the American Bell Telephone Company. This patent was for the use of carbon electrodes in a battery transmitter. No other material has been found as a practical substitute for carbon.

These two patents were for 17 years from the date of their issue, and if either or both of them had been found valid, it would have continued the Bell telephone monopoly to the year 1908 or 1910.

When the Berliner patent was issued, Milo G. Kellogg obtained a certified copy of the record of the application in the Patent Office, and after a careful study of the same for several months became convinced that the patent was invalid for several reasons and would not be sustained by the courts if intelligently litigated. He also realized that unless its validity was attacked in some unusual manner it would remain as a menace to prevent any extensive competing use of battery transmitters, and when it came to be litigated, if such a case should arise, the defense was likely to be weak and ineffective, and the patent, therefore, likely to be sustained, and thus the Bell monopoly would continue to the end of the term of the patent. He then conceived the idea that the question was one of great public importance, and that the patent having, as he believed, been improperly granted, the government itself should begin a suit to test its validity on the basis of annulling or revoking it. It was then certain that a patent could be revoked on the ground of fraud, but it had not been adjudicated whether a patent could be revoked on the grounds of invalidity. The proper channel for bringing a suit to annul or revoke a patent was through the Attorney-General in the name of the United States against the party or his assigns claiming the right of monopoly under the patent.

He prepared a brief of about 150 pages, giving the various grounds on which he believed the patent was invalid, and in November, 1892, presented the same to the Attorney-General. After the matter had been considered, and with the approval of President Harrison, a bill was filed by the Attorney-General in 1893 in the name of the United States against the American Bell Telephone Company. The first decision in the case was by Judge Carpenter, who declared the patent invalid for two reasons,

but did not pass on the other grounds of invalidity which were raised. These two reasons were, first, fraud in obtaining the patent, and second, the fact that a patent had been granted to Berliner on the same invention in the year 1880. The case was carried to the United States Circuit Court of Appeals, which held that the only ground on which the patent could be cancelled or annulled was that of fraud, and that the other claims of the bill could only be set up as defense in a suit brought by the owner against an infringer. This court found that no fraud had been proved, and that, therefore, the patent could not be ordered cancelled. The Supreme Court on appeal took the same view of the case.

After the decision of Judge Carpenter, in the Circuit Court, the few companies which had begun to manufacture and build exchanges took new courage and many others entered the field, and this new impetus assured our present great success in spite of all that has been done to discourage us.

After the decision of the Supreme Court in the government case, the testimony was completed in the infringement cases which the American Bell Telephone Company had, in the meantime (August 5, 1895), brought against the National Telephone Manufacturing Company and the Century Telephone Company. The defenses in these cases included the same grounds of invalidity set up in the government case except that of fraud, and the decision of Judge Brown, recently handed down, practically sustains all the defenses except one.

The Edison patent on the use of carbon in the transmitter was no doubt valid; but the question arose concerning it as to the effect on its life of section 4,887 of the Revised Statutes. The application for this patent was filed before Edison had taken out any foreign patents on the invention, but the patent itself was issued after he had taken out foreign patents, and, in fact, after such foreign patents had already expired. With one interpretation of the meaning of section 4,887, the foreign patent would limit the life of the United States patent, and the patent had already expired at the time of its issue. The interpretation of this section had already been raised in regard to other patents, but had never been passed upon by the Supreme Court, and it was uncertain what the decision there would be. There was pending before that court a suit known as the Bates Refrigerator Company *vs.* Ferdinand Sulzberger, *et al.*, in which this particular question was involved. This case was one of minor importance, but on the outcome of the same depended the question as to whether the Edison carbon patent, owned by the Bell company and some important electric light patents owned by the General Electric Company, should extend for 17 years or had already expired. When this comparatively unimportant Bates refrigerator case came to a hearing before the Supreme Court, the side which was favorable to the Bell company's contention was most ably and elaborately presented, Mr. Storrow, chief counsel for the American Bell Telephone Company, and other noted lawyers, presenting very able briefs on the subject. The other side was also well represented, especially by Mr. Wetmore, of New York. There was, however, nothing to show that there was practically anything more at stake than the contest between the Bates Refrigerator Company and Sulzberger. At the hearing, however, a request was made and granted that Hon. Charles H. Aldrich, formerly Solicitor-General, be permitted to file a brief in the case on behalf of Milo G. Kellogg, as "one whose interests as an inventor of telephone appliances, and as a stockholder in companies operating telephone exchanges and manufacturing electric light and other apparatus, would, in his opinion, be disastrously affected by an interpretation favorable to complainant of section 4,887 Revised Statutes." Mr. Aldrich's brief thus filed pointed out to the court the great interest involved in the suit, and the legal grounds for an interpretation of the section which would, in fact, limit and make the Edison patents ineffective. The Supreme Court decided the case in favor of defendant, holding that under section 4,887 United States Revised Statutes, the expiration of a foreign patent limited the grant under our laws to that time; and, as far as the statutes then stood, the Edison carbon patent became a dead issue.

However, while this Bates case was pending before the Supreme Court, several bills to amend section 4,887 were introduced in Congress, the effect of which, if passed, would be to give life to the Edison patent for 17 years from the date of its issue. The real animus and source of the instigation of these bills were not apparent. The fact of their existence and the real motive and effect of the same came to Mr. Aldrich's knowledge, and he prepared a memorial to Congress on the subject, entitled "The American Bell Telephone Monopoly and the Pending Legislation in Its Interest." A copy of this memorial was sent to every member of Congress. The effect of the same was that the real motive for the proposed legislation was exposed and thus the bills were defeated.

But to show how adroitly the affairs of the American Bell Telephone Company were managed we must now consider a few facts which were the result of the thought of great minds employed to prolong the monopoly. Edison having applied for foreign patents, and they recognizing the danger of limiting his rights under section 4,887 Revised Statutes, should their efforts fail to repeal or annul it, the Berliner application for a patent was, by shrewd manipulation, kept pending in the Patent Office for 14 years, and he, so far as we have discovered, made no application in a foreign country under the statutes of which the patent in this country would be limited, but only in such countries the laws of which would not bring it under our court's interpretation of section 4,887, in view of the danger growing out of the Edison foreign patents. After the Berliner caveat and application had passed to the ownership of the American Bell Telephone Company, which did not claim a constant-contact telephone which would reproduce speech, but a make-and-break transmitter which would reproduce musical sounds, this able corps of experts in the pay of that company managed, after this delay of 14 years, to obtain a patent by amendment, claiming just the invention that Mr. Berliner had disclaimed in his caveat and original application.

After the decision in the United States Supreme Court in the government case, through the efforts of J. D. Leatherbee, treasurer of the National Telephone Manufacturing Company, Edward P. Payson, of Boston, a very able and conscientious lawyer, proceeded with the arduous task of completing the proofs to sustain the defenses set up in his answer to the bill of complaint in the case of the American Bell Telephone Company against the National Telephone Manufacturing Company.

Mr. Payson gave to this case a great portion of his time and his best thought from the time of his retainer in 1895 to the time the case was fully submitted to the court, November, 1899.

Judge R. S. Taylor, having been selected by the government as one of the counsel in its suit and being very familiar with the questions involved, was retained to file a brief and make an oral argument in the case against the National Telephone Manufacturing Company on behalf of the defense.

February 27 last, Judge Brown, of the United States Circuit Court, District of Massachusetts, handed down his decision after considering the case from November, 1899, to that time; and from his rescript, indicating his deep study of the questions involved in this important case, the impartial words of the learned judge clearly indicate his conviction as to the deep-laid scheme to prolong a monopoly.

We certainly should appreciate the efforts of these men who have so ably resisted the efforts of the representatives of the American Bell Telephone Company to retain that which by law had passed to the people, and no voice should be heard except in the highest commendation of their work. Their intelligent and arduous labors have defeated the skill and cunning of those who were employed to try to deceive our patent officials and our courts. I feel at this time it is not only the duty but the pleasure of this organization to make public acknowledgment of their services.

This combined effort has resulted in the decision of Judge Brown, in which he holds:

First—"That at the date of the application, June 4, 1877, Berliner had not made the invention covered by the patent issued to the American Bell Telephone Company on November 17, 1891."

Second—"That the invention designated in the patent is radically different from the invention described in the application."

Third—"That the invention was previously patented by Berliner."

Fourth—"That Edison was the prior inventor."

Judge Brown agrees with the well-known position of all telephone inventors that Berliner, so far as his claim to a microphone is concerned, invented nothing.

These facts together with the policy of the Bell companies in dealing with the people has been the chief incentive to invest in this field. The people were anxious for relief from their arbitrary methods and have always welcomed an independent company.

Having proven our legal right to give telephone service by good and efficient methods, and having demonstrated our ability to compete with the old companies, it becomes now a question of working together for one common end; and it is important that at this meeting we consider such questions as will lead us to unity of action. The present year will add much to our present strength by placing a large amount of money at our disposal.

In closing, I wish you all a profitable year, and thank you for your many courtesies.

Several announcements were then made, after which Mr. H. D. Critchfield moved that public acknowledgment of gratitude to the men who have been constantly on watch to frustrate the enemy, be given. The Hon. E. B. Fisher, of Grand Rapids, Mich., moved an amendment which made Mr. Critchfield a committee to draft suitable resolutions. Motion and amendment both being unanimously carried, the first day's session was adjourned to permit the delegates present to visit the Pan-American Exposition.

WEDNESDAY, JUNE 12.

The second session was called to order promptly by President Thomas, a large crowd being in attendance.

The roll of states was called for nominations for the executive committee.

It was decided to take a trip to Niagara Falls and over the Gorge Route in the afternoon. An invitation from the director-general of the Pan-American Exposition to meet on the grounds the next afternoon was accepted.

Hon. S. P. Sheerin, of Indianapolis, then read his paper entitled "Village Exchanges and Farmers' Lines." This paper appears in full in the ELECTRICAL REVIEW, this issue.

Mr. J. B. Ware, of Detroit, Mich., in opening the discussion, said: Mr. Sheerin

has presented the subject so ably that discussion is difficult. There is no question but that the farmer's telephone is more valuable to the general situation than most of us imagine. This participation in the work has secured a sort of social cooperation which introduces a new and interesting feature. The cost of the service is so slight that those who have worked together to build their own lines have learned the telephone's advantages.

Farmers' service is of two classes. The first is that of the farmer who lives near a city. There is no difficulty in connecting this class directly with the city exchange at mutually satisfactory rates. The second class is the "social class" or the isolated community where the telephone is mostly used for social purposes. What such people want is as many on a line as possible for convenience in social chat. What these farmers want is not commercial advantages, but rather opportunities to talk mutually. Such farmers have cut the poles out of their wood-lots, paid $8 apiece for sets, and built shackling lines running all about the community. They have put in their own switchboard, too. Now, you can't develop a toll-line system to compete with this sort of thing. From this aspect it is, in a way, a menace. The independent companies have made a considerable mistake in establishing rates that are too low for toll-line and party-line work. For that class of farmers who are in the vicinity of cities will soon demand separate metallic circuits. Outside of the "social" element, the farmers will soon want better service with fewer on the line. In the next two or three years they will demand separate circuits, because if they have goods to market they can't do business on party lines. The lesson to be drawn is to put up heavy pole lines, with 10-pin cross-arms, for the number of wires required on a given line will certainly grow. As they require these separate lines the farmers will pay a little more for service. I am deeply impressed by the fact that farmers' telephones have proved of enormous advantages to the independents in the past. A large number of independent companies have not developed their farmer communities. If you don't do it now, the Bell people will do it for you next year. And it pays to build *right* when you build for farmers.

Mr. W. H. Morrison, Bryan, Ohio, read a newspaper report concerning the finances of the Central Union Telephone Company.

The secretary read a decision concerning ownership of trees in the street, by Judge Phillips, in an Ohio court.

Hon. T. J. Fricker, Ashtabula, Ohio, in further discussion of Mr. Sheerin's paper, made a very facetious address. He referred to decisions in the Michigan courts permitting the cutting of trees anywhere necessary. He referred to a report of this published in the ELECTRICAL REVIEW for May 4, 1901. In Ohio, the courts are stringent against tree cutting. Steps should be taken to secure more generous legislation determining the right of use of highways.

Mr. Fricker cited a case of trouble with an abutting owner. "When you have it," he said, "you must make the man think you know your rights, whether you have any or not!" Referring to the growth of independent telephony, Mr. Fricker said that no man who was at the birth of the association five years ago would have dared to believe that the business would reach its present status. He paid a high tribute to the ability and zeal of Judge Thomas, which was greeted with much applause.

He spoke of the telephone girl and her vital importance as a factor of the exchange service. Investments in telephone plants are often placed in inefficient hands. He argued for better pay and all possible good treatment for the girls. They should not be overworked or underpaid and should have every comfort, for she, by work, returns the dividend. Her efficiency determines the earnings of the exchange.

Mr. Charles E. Wilson, of Philadelphia, who was on the programme for a paper on "The Telephone Situation East of the Alleghenies," stated that Senator C. W. Kline, of Pennsylvania, had prepared a paper which he asked to have substituted for his. He asked the convention to meet at Philadelphia next time. Mr. Wilson described the new independent exchange system in Philadelphia, and said that it now has over 4,000 contracts. The Kellogg switchboard will be used and the station instruments are of the company's own design. About half the rates now charged will be asked. It is believed, he said,

GROUP OF DELEGATES AND VISITORS ATTENDING THE CONVENTION OF THE INDEPENDENT TELEPHONE ASSOCIATION OF THE UNITED STATES, BUFFALO, JUNE 11-13, 1901.

that this will be the finest plant, from an engineering standpoint, in the world.

Senator C. W. Kline then read his paper, entitled "Independent Telephone Development East of the Alleghenies." Senator Kline's paper will be published later.

Mr. C. E. Stinson, of Rochester, N. Y., opened the discussion. He described the conditions in Rochester leading up to the formation of an independent exchange in that city, and the growth of the business. He described the necessity for operating his cables in the same conduits with high and low-tension power and lighting wires. More than 250,000 feet of such cable have been successfully working for some time without trouble. Mr. Stinson's account of the troubles of the Bell and independent companies in Rochester was very interesting. He invited the convention to meet next time in Rochester.

The session was adjourned at 1.30 P. M. to take a trip over the Niagara Falls gorge route.

THURSDAY, JUNE 13.

The third session opened with the reading of a paper by Mr. L. W. Stanton, of Cleveland, Ohio, entitled "Exchange Service." Many diagrams were shown. The paper was a strong argument for central battery exchanges and intermediate boards. It was good, practical matter, and was well received.

Discussion followed by Mr. Curtis, of Sandusky; C. H. Judson, of Minneapolis; Hugh Doherty and S. B. Fisher.

Mr. Fisher's paper, entitled "Bell Methods," was read, and will be published later.

It was discussed by H. D. Critchfield, C. W. Kline and S. P. Sheerin.

Vote of thanks to President Thomas for his services was unanimously carried.

Hon. H. D. Critchfield delivered an address instead of reading his paper. It was a fine effort and was enthusiastically received. He spoke of legislation to define way rights on highways, litigation to defeat Berliner patent, which would have failed but for work of association and manufacturers; made an able plea for continued support of the association and for the importance of standing together. New corporation legislation should be closely watched, he said, in telephone interests. He bitterly condemned those who sold out their plants and their friends simultaneously.

President F. G. Jones, of the American Electric Fuse Company, Chicago, started contributions from manufacturers with $100. All manufacturers present at this point joined association.

Mr. Critchfield's address was then discussed and legislation punishing trespass on telephone lines was favored.

The following officers were elected for the ensuing year: President, Judge James M. Thomas, of Cleveland, Ohio; vice-presidents, H. C. Young, Columbia, Pa.; C. E. Stinson, Rochester, N. Y.; W. H. Durin, Cedar Rapids, Iowa; secretary and treasurer, S. P. Sheerin, Indianapolis; first assistant secretary, J. B. Ware, Detroit; second assistant, Chas. E. Wilson, Philadelphia; third assistant, T. B. Lee, Pittsburgh.

President Thomas made appropriate concluding remarks, and after votes of thanks to the local committee, press and Mayor, and city of Buffalo for use of hall, the convention adjourned at 1.30 P. M.

Demand for Electrical Machinery in Spain.

It is reported that a new electrical company has been formed in Madrid, Spain, with a capital of 2,000,000 pesetas, with the idea of introducing into that kingdom electrical machinery both for its own use and for general installation throughout the country. The company's two engineers, Señors Ernesto Presser and Adolfo Barbe, have been instructed to carry on the necessary negotiations. Another company has been formed at Saragossa with a capital of 3,500,000 pesetas, which will also require considerable machinery and apparatus. The name of the latter company is the Sociedad de Aprovechamiento del Rio Gallegos.

Electrical Mining in Arizona.

Electricity is taking an important part in the development of the mineral regions in Arizona, and San Francisco capital is the first to undertake the ambitious scheme of supplying the machinery and camps of the extensive mineral belt in Arizona with electrical power. A generating plant is to be established on Salt River, which runs through a rich copper belt in eastern and central Arizona. Wires will be strung in all directions, running from 30 to 60 miles in length, to the different mining camps, and the engineer in charge states in his report that the waters of the Salt River are capable of generating more than 3,000 horse-power in the dry season. The present plan for electrical generation is but one of several similar projects, and the proposed plant is to be completed in about 14 months. The territory embraced by the projected system contains heavy copper deposits and valuable leads of silver, gold and galena.

Telephone Convention Notes

The Chase-Shawmut Company, Boston, was represented by Mr. A. F. Moore.

The Rolfe Electric Company, Chicago, was represented by Mr. Rolfe in person.

The Ericsson Telephone Company, New York, was represented by Mr. L. P. Smith.

The Electric Appliance Company, Chicago, had several representatives present.

The Bridgeport Brass Company, of New York, was represented by Mr. Wiley Brown.

The Okonite Company, Limited, New York, was represented by George T. Manson.

The American Electric Fuse Company, Chicago, was represented by President Frank Jones.

The Independent Telephone Supply Company, Chicago, was represented by the Messrs. Bragg.

The Williams-Abbott Electric Company, Cleveland, Ohio, was represented by Mr. L. Sands.

The Western Telephone Construction Company, Chicago, was represented by Mr. M. P. Bowman.

The American Toll Telephone Company, Cleveland, was represented by Messrs. Kaneen & Foss.

The North Electric Company, Cleveland, distributed good luck souvenirs which were much sought.

The American Miniature Lamp Company, New York, was represented by General Manager Jaeger.

The Century Telephone Construction Company, of Cleveland, Ohio, was represented by Messrs. Burt Hubbell and Moore.

The Miller-Knobloch Company, South Bend, Ind., was represented by Mr. Otto Knobloch who was registered at the New Tifft House.

The Standard Underground Cable Company, New York and Chicago, was represented by Mr. J. R. Wiley, manager the western office.

The Haynes & Noyes Company, Chicago, distributed literature descriptive of the intercommunicating systems which it manufactures.

The John A. Roebling's Sons Company was represented by Mr. T. A. Tingley, of Trenton, and several representatives from the Chicago office.

Mr. James I. Cuming, president of the Central Telephone and Electric Company, St. Louis, Mo., was unavoidably absent from the meeting.

The North Electric Company, Cleveland, Ohio, was represented by Messrs. North, G. C. Steele, F. F. Sapp and Raymond Hendrickson.

The American Electric Fuse Company, of Chicago, was represented by Messrs. Frank G. Jones, J. A. Kenny, P. E. Allison and G. H. Johnson.

President Farr, of the Farr Telephone and Construction Company, of Chicago, at the last moment was prevented from joining the Chicago party.

The Clark Automatic Telephone Company, of Providence, R. I., was represented by J. L. Putnam, engineer; F. D. Ingraham and L. A. Chittins.

William J. Murdock & Company, Chelsea, Mass., was represented by Mr. William J. Murdock, who distributed miniature specimens of the Murdock receiver.

The Electric Gas Light Company, Boston, manufacturer of the Samson battery, was represented by a member of its home office staff.

The Automatic Telephone Meter Company, Boston, had specimens in operation of its automatic meter for measured-rate telephone service.

The Mayberry-Holmes Company, West Medford, Mass., exhibited a party-line system in connection with a Couch & Seeley instrument.

The Couch & Seeley Company, Boston, was represented by Mr. E. B. Seeley in person. This company had an interesting display in one of the parlors and distributed catchy souvenirs.

The American Vitrified Conduit Company, New York, was represented by Mr. B. S. Barnard. This company is one of the exhibitors in the Electricity Building, at the Pan-American Exposition.

The Monarch Fire Appliance Company, New York, manufacturer of the dry fire extinguisher, "Kilfyre," was represented by Gen. C. H. Barney. The company distributed an artistic booklet on the uses of "Kilfyre."

The Hipwell Manufacturing Company, Allegheny, Pa., was represented by Messrs. H. H. and T. H. Hipwell. The company showed samples of its "Little Gem" central energy telephones and a line of telephone parts.

The Swedish-American Telephone Company, Chicago, was represented by Mr. E. B. Overshiner, president, and Mr. C. H. Macklin. The company had an exhibit of exchange apparatus in one of the parlors of the Iroquois Hotel.

The Williams Electric Company, Cleveland, was represented by Mr. J. A. Williams and Superintendent J. A. Stratton. This company, in its exhibit, displayed a line of telephones and telephone parts—also a new long-distance bridger.

The Eureka Electric Company, Chicago, was represented by Messrs. Arthur Stein, I. J. Kusel and George Pratt. This company has a branch office in the Ellicott Building, and arranged there a complete display for the benefit of the convention visitors.

The Sterling Electric Company, Lafayette, Ind., was represented by W. E. Doolittle, general manager. Mr. Doolittle speaks of a larger volume of business during this season for his company than ever before received in the career of this company.

The American Electric Telephone Company, Chicago, was represented by Messrs. P. C. Burns, president; J. G. Ihmsen, general manager; P. J. Eubanks, C. E. Kammeyer, J. J. Speed and A. E. Reid. This company distributed favors in the form of a leather card-case.

The Columbia Telephone Manufacturing Company, Chicago, Ill., was represented by Mr. J. G. Nolen. This company showed for the first time a new line of telephones and switchboard parts. The company is of recent organization and has several men well known in the telephone field identified with it.

The Kellogg Switchboard and Supply Company, of Chicago, was represented by the president, Mr. Milo G. Kellogg, and Messrs. Kempster B. Miller, J. C. Neely and a number of others. This company has a particularly fine exhibit in the Electricity Building at the Pan-American Exposition, to which all visitors were cordially invited.

The Holtzer-Cabot Electric Company, Boston, Mass., was represented by Mr. Newman H. Holland, of the home office, and Mr. Edwin R. Harding, manager of the Chicago office. This company made an exhibit, in one of the parlors, of magneto telephone parts, and the specialties for which it has established a reputation in the telephone field.

The Stromberg-Carlson Telephone Manufacturing Company, Chicago, was represented by the following staff: Messrs. A. Stromberg, Henry Shafer, C. Steiger, W. M. Davis, Paul Kraemer, G. Hutch and A. H. Brown. This company has a telephone system in operation at the Pan-American Exposition, the system being much admired by the telephone visitors.

The Lambert Schmidt Telephone Company, New York, was represented by Messrs. Lambert Schmidt, Powell, Schwartz and W. W. Bostwick, Jr. This company showed a complete line of telephone instruments of all types, switchboards and field operating sets. The exhibit was one of the most complete displays and attracted more than passing attention from the exchange visitors.

Among the souvenirs presented to delegates were handsome nickeled pliers by the representatives of the John A. Roebling's Sons Company, of New York, and penholders by the representatives of the Hipwell Manufacturing Company, of Allegheny, Pa.

French Cultivation of Gutta-Percha.

In 1898 the French explorer Raoul collected in Malacca about 1,500 self-sown plants of *Isonandra gutta*, which he raised in the conservatories at Marseilles. When grown they were distributed in the Congo, in the West Indies and in French Guiana. The welfare of the plantations is being carefully watched.

VILLAGE EXCHANGES AND FARMERS' LINES.*

BY S. P. SHEERIN.

With all due respect to our farmer friends (and in my high regard for them, I allow no man to go before me), I do not believe that they yet appreciate the great blessing the telephone has brought them.

The telephone—which, after all, has only had its development in the last six or seven years—is a greater boon to farmers than to any other class of people.

The great drawbacks of country life are its isolation, its meagre opportunities for social intercourse, and its still fewer opportunities for protection.

When we add to these the disadvantages of being out of touch with the market, and out of reach of the great news pulse of the country, the sum of the country life's shortcomings is complete.

The telephone changes all this. It comes as a benefactor, exceeding all others in its possibilities and usefulness. No man can fully estimate its benefit to the farmer. It brings his ear close to the market tickers of the world, brings the weather report to his door in time to protect his crop and cattle, and travels what would be to him and his horses weary miles in the ordinary transaction of his every-day business.

The telephone should be welcomed by the farmer, with open heart and ready hand, to the best of everything he has. I regret to say that this is not always done. Our farmer friends still insist, in a great many localities, upon being somewhat beggarly in their treatment of the telephone. The telephone can not, any more than any other agency, perform its proper functions except under fairly good conditions. It is entitled to the very best we can give. It is no longer an experiment; it has demonstrated its usefulness and its right to a fore-front position in the economies of life as completely as have the locomotive, the steamboat, the reaper and the threshing-machine. It was extremely unfortunate in its birth, and its boyhood associations were not good; but it is fast approaching a glorious American manhood—"redeemed, regenerated and disenthralled."

Men do not now hesitate to put sufficient money into railroads; the steamboats on our lakes and rivers are perfect floating palaces; and the wise farmer pays a good price and gets a good article of reaper and threshing-machine when he has reaping and threshing to do.

* A paper read before the Independent Telephone Convention, June 12, 1901.

It is, I am afraid, a slight reflection on the usual good sense of the average farmer, who has progressed in other respects out of the cheap way of doing things, to find him insisting upon putting up cheap, grounded telephone lines on native poles 300 and 400 feet apart, marring the landscape, and furnishing temptations to profanity by those who have to use them.

A poorly constructed and badly managed country telephone line is many hundred times worse than no telephone at all. There was a time when these things served their purpose as educators, but that time has passed.

The country telephone is fast becoming the most important feature of rural life. It should be treated with the respect and liberality which are its natural due.

The country telephone line (and all other telephone lines which go along the country road) should be considered as part and parcel of the road itself. They should not (in my judgment) be considered as tenants of the road, or as something that is there by sufferance, or by the permission —grudgingly given—of those, who, for the time, do not appreciate its advantages; but they should be regarded as a part of the road itself.

One of the primary functions of roads was that of facilitating messages between civilized peoples. The savages of the forest used their foot and bridle paths to transmit messages of peace or war, love or hate. Civilization early found its use for the messenger, and so well were his rights established that, I believe, it was laid down in the early common law that the pedestrian bearing a message along the public highway had rights superior to the horseman. The telephone is a messenger. More than that—it is a troop of messengers. It carries, from home to home, from heart to heart, the messages of the people. It should be as highly regarded and as free from interruption on the highways of the country as the bearer of a writ of *habeas corpus*. There is no other means by which messages can be transmitted with so little wear and tear to the roadway.

I look forward to the time when telephone lines will be regarded as such sacred property that men and boys will no more think of interfering with a country telephone line than they do now of throwing stones at windows or killing song birds as they pass along.

In order, however, to be entitled to this high regard of the public the telephone must, by its outward appearance, command the respect of the people. We are apt to say, sometimes, that "clothes do not make the man." I think this is true; but we can not deny that outward appearances go a great way toward giving good or bad impressions of people and things.

Telephone lines should be substantially and neatly constructed. They should be of the very best material—good, heavy, well-shaped poles (no pole shorter than 25 feet, nor smaller than 6 inches in diameter at the top); cross-arms should be of regular length; and the wire put on in a thoroughly practical manner.

I have an impression that, as time goes on, and our high regard for the telephone increases, we may get along with shorter poles and put our wires as near to the ground as electrical conditions will permit. My thought is that we will not have to use very high poles anywhere except at road crossings, and it is barely possible that we may reach a condition where it will be found easier to go under cross-roads than over them.

Wherever it is possible I think that not more than one line of poles should occupy the same side of the road. It will be entirely possible to build a line, sufficiently strong and symmetrical, to take on all the lines that should go along any particular roadway.

Of course, it goes without the saying, that all lines should be of iron or copper metallic and, as nearly as possible, the maintenance of the whole line should be under the control of one head without reference to how many people or companies may be interested in the pole line.

One of the great troubles of the country telephone line—as, indeed, it is one of the drawbacks we all have in cities—is the trees. In the cities, we are able to escape this annoyance very largely by the use of cable; but, of course, it would be impossible to do this in the country. Not taking into account the great additional cost of that sort of construction there are electrical considerations that make a continuous long cable line an impossibility. The trees on the country roads should give way to the telephone.

I am an advocate of trees, and believe that we should cultivate our forestry in every possible way consistent with the discharge of our other obligations. But as it was necessary to trim away the original forests to make the roads, so would I trim away the trees along the side of the roads which interfere with that part of the road which belongs to the telephone.

Trees along highways, near residences, can just as well be set back 25 or 30 feet. They have no business on the highway or overlapping the highway, when they interfere with the uses of the highway.

The telephone is a proper use of the highway. In many respects it is the most important use. Being a comparatively new thing it may take legislatures and courts a little while to appreciate all this, but just as surely as our American legislation and jurisprudence have found a way to clear all other obstacles from the path of material progress, so they will find a way to order the trees along the highways set back out of the way of the telephone. They will do this because the people will demand it—and the people here always get what they want.

Now, as to village exchanges: I believe they ought to be made just as numerous as the wants of the people may require—in fact, I think that a great number of small exchanges is infinitely preferable to a number of long, heavily laden party lines. There is not only utility in this, but a great deal of economy as well. The larger the number of people to be reached, and the quicker we can reach those with whom we desire to communicate, the better our service will be.

In my judgment, village exchanges should be encouraged everywhere, and these village exchanges should have direct communication with the county-seat exchanges and the exchanges in other towns of the county; and these exchanges, in turn, should be connected with the long-distance lines of the several states.

Our combination of lines and exchanges should be so complete that the farmer, sitting at his own hearthstone, can communicate by telephone with any one, no matter where located, to whom he desires to speak. The equipment of these country exchanges should be, in all respects, first class. I regret that this is not always the case. It is often very poor and I come, now, to show some of the causes for this.

With all due respect to the manufacturers (and I think the manufacturers are entitled to a great deal of credit for the development of the telephone business), I can not help the feeling that they are very largely responsible for a great lot of shoddy, inefficient and wholly abominable telephone equipment in the country. They go upon the theory that the farmer wants something cheap and that the way to catch him is to present a very low-priced article, without very much reference to how long it will last or what service it may give him in the meantime. This is little short of criminal, and can not be too strongly condemned.

This association and all other people largely interested in the telephone business who want to escape responsibility for bad service by other people, as well as by themselves, should set their faces

firmly against the manufacturers who make specially "Cheap John" equipment for farmers' lines.

The truth is, that, for many reasons, the farmer ought to have better equipment than anybody else. It is very much more difficult for him to get repairs than it is for any one else; and besides, in the very nature of things, he soon becomes very much more dependent upon his telephone than does the man living in the city where distances between business associates and neighbors are very much less, and where other facilities for communication are very much more numerous.

Another explanation for bad equipment in the country, is the very short-sighted practice indulged in by some city companies of selling their worn-out material to farmers at reduced prices. A chain is only as strong as its weakest link; the 'phone or switchboard that is not fit for use in town is certainly not fit for use in the country. "Good equipment everywhere" should be the motto.

The battlefield of the great telephone war which has been raging in this country for the past five years—with the victories always on the same side—has been largely transferred from the cities to the country. The Bell companies, in the days of their monopoly—and, in fact, until quite recently—positively refused to furnish service to the farmer upon any terms.

Now they have changed their minds about that, and seem to have concluded that the farmer and the villager are not such bad fellows after all. But their repentance has come too late. The farmer and the villager have been doing a thing or two for themselves in the meantime. And this is part of what they have done in Indiana. I feel that you will pardon me for talking a little about my own state.

We have had a most desperate fight in Indiana for the past five years, notably for the past two years. We have been threatened by the opposition with everything from total annihilation to everlasting abode in eternal darkness.

We were assured, upon the honor of the very clever gentlemen who manage the Central Union Telephone Company, that we would lose every dollar we put into the telephone business; with the further cheerful assurance that they knew what they were talking about, and would personally see to it that their prediction would come true.

In furtherance of this last determination they spent a good deal of their "war appropriation" in superhuman efforts to prevent our people from putting money into the telephone business. It would be amusing, now, to read some of their statements. They would make the man who was expelled from Hades, for incurable falsification, green with envy.

We learned long ago in Indiana that the immortal Lincoln was right when he said that, while one might fool part of the people all the time, and all of the people part of the time, he could not fool all the people all the time. When the first independent telephone exchange was constructed in Indiana the Central Union Telephone Company had been paying, for 12 years, on a capital of $6,300,000 (three-fifths of which was pure water) annual dividends ranging from four to six per cent. They had no bonded indebtedness and no floating indebtedness that was reported.

When the fight with the independents began they ceased paying dividends, the last one being paid in 1895. In 1897 they borrowed $2,500,000, in 1899 they borrowed $6,000,000—$2,500,000 of which was set aside to pay the holders of the first mortgage of $2,500,000.

They now have, in addition to this $6,000,000 mortgage (according to recent publications), a floating indebtedness of $1,250,000.

Now, let me tell you what all this has resulted in. The Central Union now has (as shown by its own figures) 22,000 telephones in the state. The real number is smaller than this, but we can afford to be generous and I propose to give them all they claim.

The independent interests have, in the State of Indiana, by actual count, 52,469 telephones. I know you will excuse me if I repeat those figures. After a "war expenditure" of $7,250,000—begun upon the independent movement when there were less than 3,000 independent telephones in the state—the Central Union now has, for its expenditure, 22,000 telephones, and the independent movement has 52,469.

The total population of Indiana (according to the census of 1900) is 2,516,000. There are 92 counties in the state, and there are 27 of these in which the Central Union (or any other Bell company) has no exchange, large or small.

The population of these 27 counties aggregates 491,000, and the aggregate number of independent telephones in these 27 counties is 14,262. The total number of Central Union and other Bell company telephones, used at toll stations only, in these 27 counties is 197.

I submit this Indiana statement more especially for the benefit of our friends in different parts of the country who are just beginning their fight with the great monopoly. If you ask me how they fought us I can simply say—every way.

If there is any mode of guerrilla warfare that they left untried we have not been able to find it. The independent development in Indiana has been accomplished by Indiana self-helpfulness and Indiana capital. Of the millions invested in the independent telephone business in Indiana, less than $100,000 has come from outside of the state. More than that, the business is practically out of debt. The total indebtedness upon the Indiana independent telephone property is less than 10 per cent of its total value.

In this great success, the farmers and villagers of the state have been of incalculable help. They realize (as all sensible men, similarly situated, must have realized) that their only hope was in becoming a part and parcel of the great independent movement. The independent movement gives opportunity for self-helpfulness and intelligent cooperation. That which a man can do for himself is most likely to be quickest done. The flexibility of the independent plan is its greatest recommendation. There is no honest local movement that can not find a warm welcome and a happy home in it.

It will not do to say that good service can not be given by the independents. Every unprejudiced man will admit that the most indifferent independent service in the country, to-day, is very much better than the average Bell service was when the independent movement began. The Bell companies, all over the country, are paying us the delicate compliment of imitation in many things, but more especially in their attention to the farmers and villagers whom, in their halcyon monopolistic days, they so severely let alone.

I would advise our farmer friends, the country over, to be a little skeptical about this death-bed repentance.

"When the devil was sick,
The devil a monk would be;
But, when the devil got well,
The devil a monk was he."

Manufacturing Activity in Australia.

The insular government of New South Wales, Australia, has called for bids for furnishing several hundred thousand tons of steel rails to be manufactured in New South Wales, and which must be delivered within four years, thus involving the establishment of large ironworks in the colony. A deposit of $48,660 is required as security, and the government stipulates that the price of the rails must not exceed the price in Great Britain or America, plus the freight.

Views, News and Interviews

Professor Ira Remsen, who has just been appointed president of the Johns Hopkins University, in which institution he has been professor of chemistry for 25 years, exhibited one of those indications of the devotion of the true man of science which has done so much to adorn that eminent profession. He insisted, as a condition of his acceptance of the presidency, that he should be allowed to supervise the work of research and instruction in the laboratory. To those who have had the great privilege of being students of Professor Remsen, it is delightful to know that his active work as a teacher will not cease, even now that he occupies a position in which his opportunities for encouraging and helping those who come into his sphere of influence are larger. Few teachers in the United States have won a larger regard from those associated with them in all capacities than has this modest man of science, who has been wisely chosen for so high a position. Those who know him will not hesitate to believe that his success as an administrator will equal that he has attained as an instructor, and this means as much as can be said.

As illustrating the manifold uses of the long-distance telephone, a curious story is told of an opera singer. Some time ago she was singing in Buffalo, N. Y., and was advertised to give two new songs for the week beginning on Monday. On Saturday afternoon her new songs had not arrived, and calling up her Chicago publisher from the Iroquois Hotel, she asked him where they were. He could not tell, but had a piano moved into the room where he was, when the songs were played, the lady listening to them over the long-distance wire, and singing them after the player, time after time, until she had them perfectly. The orchestration for the songs was written in Buffalo, and the singer rendered them on Monday night to thousands who knew nothing of the novel way in which they had reached her from Chicago. Incidentally a bill of $125 was rendered for the use of the long-distance wire, but the singer was contented, and the thousands of theatre-goers who had been promised the new songs were not disappointed.

"What horn do you blow in this orchestra?" is said to have been the interrogation of the new president of a big western telephone company directed quite generally at his official staff whose duties were not clear to him. There was no mistaking the meaning, and if answers were not satisfactory that horn became silent forthwith.

Committee on Standards—Street Railway Association.

The Committee on Standards of the American Street Railway Association held a meeting recently at Niagara Falls, N.Y., to map out the preliminary work of the committee. An abundance of material, which had been gathered by the secretary, was placed before the committee for consideration. It was apparent, from the data in the hands of the committee, that both street railway operators and manufacturers of street railway appliances are much interested in the work of standardizing street railway equipment. It was decided that the best results could be obtained by apportioning the work among the members of the committee, each member to act as a subcommittee on certain parts of the work assigned to him, with power to incur reasonable expense in the preparation of plans and specifications, and to report at the next meeting of the committee. The following assignments were made:

To consider two forms of rail, the T-rail and a grooved girder rail, each with a modified form of head; to consider two forms of wheels, one a cast chilled wheel, with either spokes or plate centre, the other a steel-tired wheel, with either spokes or plate centre, tread and flange of wheel to conform to the rail to be recommended; to consider the wearing parts of trucks, the centre bearing swing bolster for double trucks to be recommended; to consider a standard for axles, journals, journal brasses, oil-boxes and brake heads such as will fit the trucks of different makers, Col. N. H. Heft, Meriden, Ct.

To consider electric motors with a view to standardizing all parts of the motor, including suspension, lead wires with connector boxes and ventilation, Mr. W. J. Hield, Minneapolis, Minn.

To consider single-truck and double-truck car bodies, including open cars, for city and suburban service, in order to determine wherein such cars can be standardized to meet the requirements of various conditions of operations, with due regard to proper ventilation, Mr. John R. Graham, Boston, Mass.

To consider the standardizing of overhead material as far as practicable along the following lines: trolley wire, trolley-wheels, trolley ears, trolley hangers, span-wires, pull-off wires, section insulators, cutouts, overhead frogs and switches, lightning arresters and all parts that go to make up the overhead system, Mr. C. F. Holmes, Kansas City, Mo.

Mr. T. E. Crossman, Park Row Building, New York, is secretary of the committee, and will receive communications bearing on the above-named subjects from any interested persons.

The Canadian Electrical Association.

The eleventh convention of the Canadian Electrical Association will be held in Ottawa, Canada, June 19 to 21 inclusive. The headquarters of the convention will be at the Russell House.

Among the papers to be presented are the following:

"Transformation from Constant-Potential Alternating to Constant-Current Alternating." Professor R. B. Owens, Montreal.

"Notes on Construction and Protection of Aerial Transmission Lines." K. B. Thornton, Montreal.

"Dominion Electrical Standards." O. Higman, Ottawa.

"Rates for Electric Light." H. L. Doherty, Denver, Colo.

"The Influence of the Load Factor on the Design and Operation of a Lighting and Power System." J. R. Robertson, Montreal.

Topical discussions will be as follows:

"The Best Practice in Cleaning, Trimming and Inspection of Enclosed Arc Lamps." The following named gentlemen have been invited to open up the discussion on this subject: Mr. A. Sangster, of Sherbrooke, and a member of the staff of the Hamilton Electric Light and Cataract Power Company, to be designated by Mr. Leyden.

"The Different Systems of Charging for and Measuring Power Consumed by Induction Motors with Varying Power Factors." Mr. Leyden, of Hamilton, Mr. Burran, of Quebec, and Mr. F. H. Leonard, Jr., of Montreal, have been invited to open up the discussion on this subject.

Mr. C. H. Mortimer, the secretary of the association, with headquarters at Toronto, Canada, requests all who intend to be present at the Ottawa meeting to notify him as promptly as possible and thereby assist the local committee in completing details relating to the convention. The convention opens at 10 o'clock Wednesday forenoon, June 19.

Phono-Electric Wire in England.

In a paper read before the Northern and Midland Counties' Association of Tramway and Light Railway Officials by Mr. A. L. C. Fell, a description is given of the experience of the Sheffield, England, tramway system with phono-electric wire. Mr. Fell states that the average tensile breaking strength of this wire was about 50 per cent greater than that of hard-drawn copper wire. Comparative tests showed that the elongation of the phono-electric wire was 35 per cent as against 23 per cent for copper, its breaking stress in tons per square inch 36.22 as against 24.86 for copper, and the twists in eight inches it would stand 34 as against 13.5 for copper.

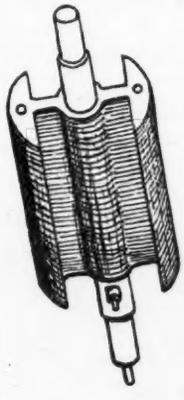
Some New Telephone Apparatus.

Additional Descriptions and Illustrations of Representative American Telephone Systems, Appliances and Novelties.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY'S APPARATUS.

The Farr Telephone and Construction Supply Company, Chicago, Ill., manufactures a number of telephone specialties of which a few are here illustrated. The magneto bridging bell shown is designed for especially heavy work and is built under extremely severe specifications. The permanent magnets are five in number, either nickel-plated or enameled, and are magnetized to that point where their permanent magnetic strength is sufficient to sustain from 10 to 12 times their own weight. The armature is laminated, as the illustration well shows, and is assembled on a steel shaft. The punchings used for this purpose are of cold-rolled Norway sheet steel of very high permeability, especially made for the purpose. It is claimed that by this construction the output of the magneto is practically double that of the old cast-iron armature type. The gearing is cast bronze, machine cut, five-sixteenths inch wide on the face and very smooth in operation. The lever is long and of the level type and has platinum contacts. The ringer is wound to 1,600 ohms on cores three and one-half inches long and three-eighths inch in diameter of soft Norway iron. Ringers of this type have been found very satisfactory in bridging work.

FIG. 1.—MAGNETO BRIDGING BELL.



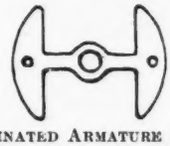


FIG. 2.—LAMINATED ARMATURE ASSEMBLED.

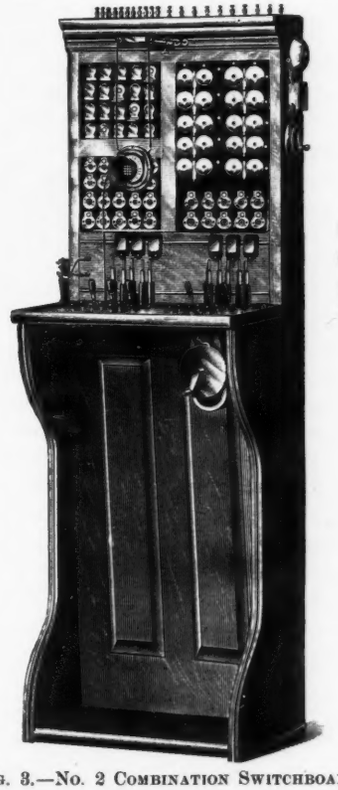


FIG. 3.—NO. 2 COMBINATION SWITCHBOARD.

The No. 2 switchboard shown in the illustration is a combination board for small exchanges where several bridging lines come in. Exchange subscribers can readily be connected with any of the bridging lines. The right-hand side of the board is provided with ringers, coils and gongs, the coils wound to 1,000 or 1,600 ohms. A small shutter between the bells of each number is arranged to fall if the bell rings, to indicate which line is calling.

AUTOMATIC TELEPHONE PAY-STATIONS.

The accompanying illustration of an automatic telephone pay-station exhibits an apparatus of this character manufactured by the Baird Manufacturing Company, of Chicago. It is intended for attachment to any telephone, being placed either upon the same wooden baseboard with the instrument or by means of steel plates inserted behind the ordinary backboard of the apparatus, attached in the manner shown in the illustration. The operation of this device is such that the central office operator can tell when the proper amount of money has been deposited in the various slots, thus giving her an audible signal. The apparatus is exceedingly simple in its construction, and is stated to be hard to tamper with and practically impossible to deceive by the substitution of other objects for coins in its operation. This method has been adopted by the Bell Telephone Company of Philadelphia, Bell Telephone Company of Buffalo, Bell Telephone Company of Canada, Delaware & Atlantic Telegraph and Telephone Company, Colorado Telephone Company, Nebraska Telephone Company and others.

BAIRD AUTOMATIC TELEPHONE PAY-STATION.

HAINES & NOYES TELEPHONES FOR APARTMENT HOUSES.

The telephone for use in apartment buildings—as in countless other uses—has at last superseded the primitive devices heretofore used.

The two illustrations herewith show

apartment telephones. Fig. 1 is the apartment entrance telephone, and is placed in the vestibule in connection with the letter-boxes. The one shown is of lemon brass

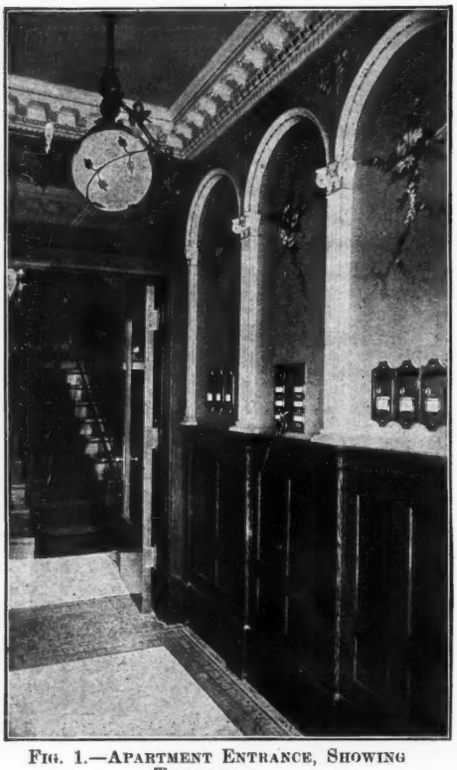


FIG. 1.—APARTMENT ENTRANCE, SHOWING TELEPHONE.

to match the hardware of the building. This telephone connects with the individual apartments and the janitor. The watch-case receiver has an aluminum back and a brass chain is bolted to this and then

FIG. 1.—EACO HOTEL TELEPHONE.

fastened securely on to the brass plate, with the bolt on the inside, so that it can not in any way be tampered with.

This receiver is hung on a rigid switch hook; hence the flow of the battery is not started, or connection made, until the receiver of the telephone in the apartment is taken down. To call any apartment from the entrance hall, it is only necessary to push the button numbered to correspond with the apartment desired.

Fig. 2 shows an instrument for individual use in apartments themselves, with push-bells, so that connection can be made with the janitor's room, laundry, café, etc., and with the entrance to the building itself. If so desired the apartments can be connected by an intercommunicating system.

These apartment entrance telephones are made with or without letter-boxes, of any design or size desired, in nickel-plate, brass, copper, or oxidized metal. The wiring of these instruments is extremely simple.

EACO HOTEL TELEPHONES.

A special feature of these telephones is that unauthorized persons can not tamper with the system, it having been designed with a view of making it as unaccessible as possible. The transmitter is fastened to the back from the inside and is specially constructed for this work, having a combination carbon and metal diaphragm. The metal diaphragm is on the outside, thus making it impossible to break the carbon diaphragm. The hook is fastened to the backboard with two machine screws from the back. The receiver cord connected on the inside of the box is held by a safety hook on the inside, taking the strain entirely off the connection and holding the cord firmly, allowing for strain without serious damage. The box itself is held by four screws from the back of the backboard. The bell is of the King type, in which the mechanism is entirely enclosed, making it necessary to unscrew the gong in order to get at the mechanism. The wiring of these telephones is all done from the back, and is entirely concealed when the telephones are placed in position on the wall. The transmitter furnished with these telephones is constructed on the style of the celebrated Hunnings granular carbon type, and is manufactured and guaranteed by the Electric Appliance Company, Chicago. The receiver regularly furnished is of the single-pole pony type, put up in the English style shell, and has a compound magnet of four pieces of the best tungsten steel, and the soft iron tip or core is nickel-plated on the end. The coil is wound with silk wire.

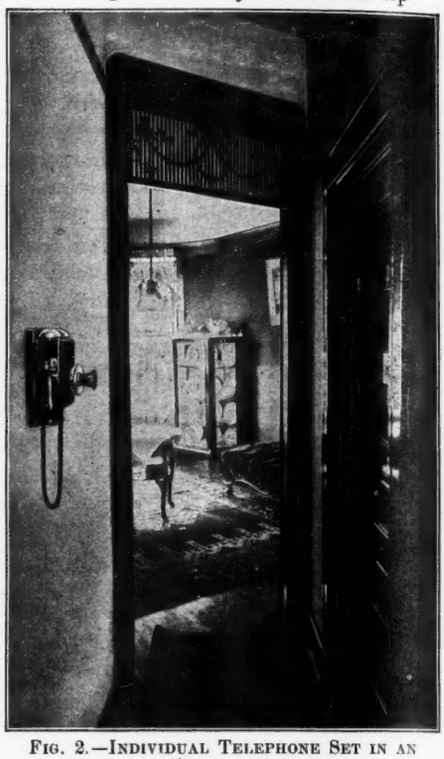


FIG. 2.—INDIVIDUAL TELEPHONE SET IN AN APARTMENT.

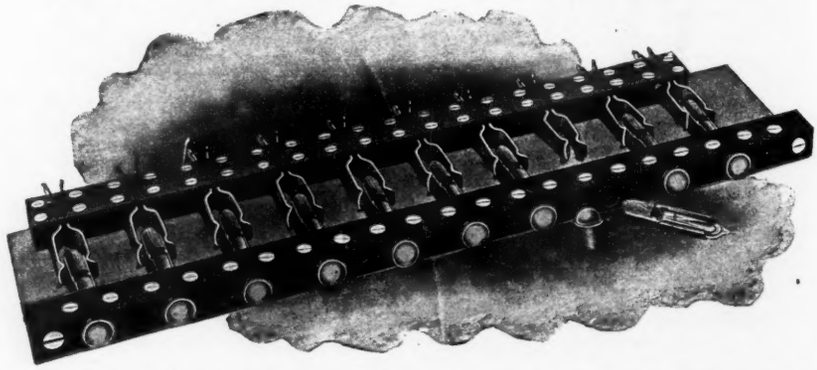


FIG. 1.—STRIP OF INCANDESCENT LAMP SIGNALS—CENTURY TELEPHONE CONSTRUCTION CO.

Where a double-pole receiver is desired in place of the single-pole, the company furnishes its regular bell type pony double-pole, the magnet of which is made in one piece, bent in horseshoe shape. Lock-nut binding-posts are used on all receivers. The Eaco hotel telephone is made in three styles: A straight push-button call, which signals the office by pushing a button placed at the bottom of the instrument;

a straight express call, which signals the office by removing the receiver from the hook, as push-button is unnecessary; a combination express and push-button call, which signals the office by removing the receiver from the hook, or by the use of the auxiliary push placed on the bottom of the telephone.

The Electric Appliance Company installs the Eaco hotel telephones on the central energy or common battery plan, the batteries all being located at one central point. One illustration respecting these telephones is presented opposite.

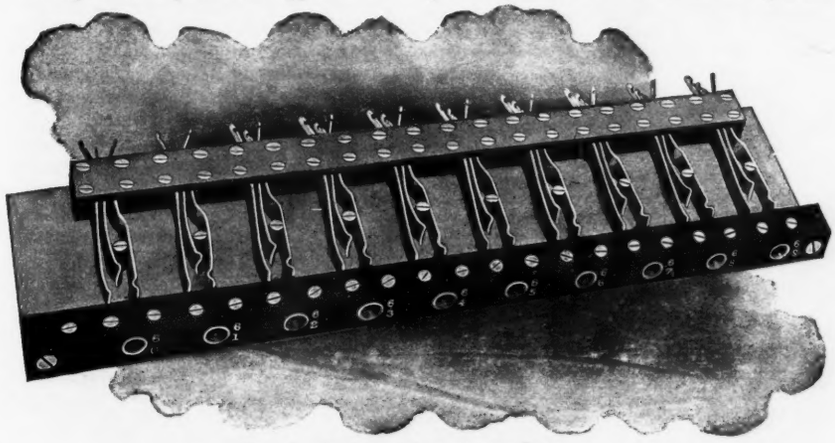


FIG. 2.—STRIP OF ANSWERING JACKS.

A NEW CENTRAL BATTERY SWITCHBOARD.

In these days to be successful a telephone manufacturing concern must not only make good instruments but good switchboards as well.

With this idea in mind the Century Telephone Construction Company, of Cleveland, Ohio, determined to make its own switchboards as well as its own telephones and after considerable study of the situation decided to design a central battery system and give it a trial. The first board has just been installed in Hornellsville, N. Y., and has proven so successful that all contracts in the future covering exchanges of 200 or more subscribers will be equipped on this plan. It is thought possible that exchanges as small as even 100 lines capacity might well be equipped with this system.

The advantages of central battery systems, where there is full supervision in the cord circuit, have been explained before, but it might be well to go over them again. First. It enables one operator to do the work of two under the old magneto system, by doing away with the necessity of cutting in to find out when the subscribers are finished talking. This doing away with half the operators also results in a considerable saving in operating expenses and more rapid service. Second. It greatly conduces to secrecy of communications and assists the manager in the maintenance of discipline, for with a supervisory system there is no excuse for an operator to listen in on the line except to answer a subscriber's call. When a subscriber calls in, his lamp lights up; when he is answered, it goes out.

When a subscriber is called, a lamp in the cord circuit lights up and remains lighted until he takes his receiver down, when it also goes out. Should this lamp remain lighted too long it indicates to the operator that he has not answered and, without cutting in, she simply rings again. Should one or both of the parties "hang up," the fact would be at once indicated to the operator by one or both of the lamps in the cord circuit, and when both are lighted she pulls the plug and disconnects, as this indicates that both parties have hung up their receivers. Third. Reduction in the size and cost of the instruments used and less need of visits from the inspector. Fourth. It gives the subscriber nothing to do but to take his receiver off the hook and hang it up again, so that he is not depended upon to assist in clearing-out.

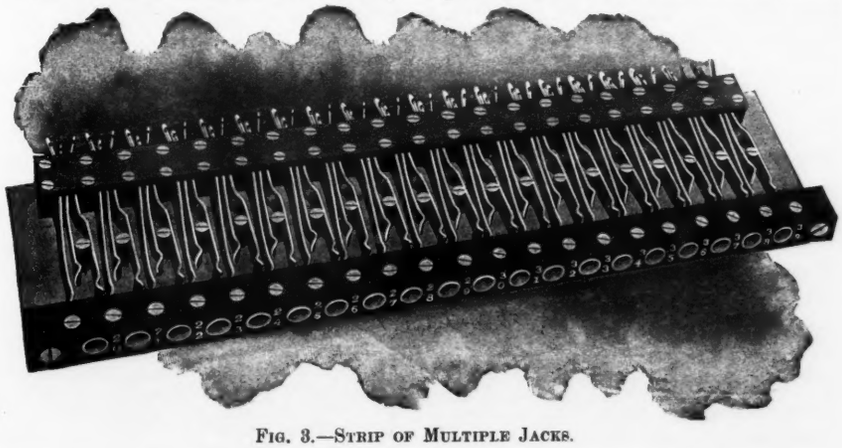


FIG. 3.—STRIP OF MULTIPLE JACKS.

In the manufacture of the Hornellsville board the builders had in mind reliability as the first requisite, and for this reason all relay contacts are of platinum, while the jack springs, shown in Figs. 1, 2 and 3, are made of strong German silver and arranged to make strong rubbing contacts.

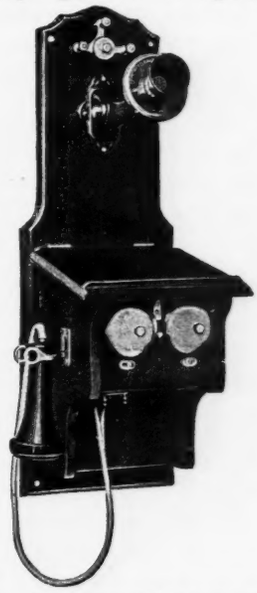


FIG. 4.—CENTURY TELEPHONE.

Signaling is accomplished by means of relays that close a local circuit through incandescent lamps, a strip of which is shown in Fig. 1. These lamps are insulated on strips of hard rubber supported on a brass plate in the most substantial manner. The cord circuit also contains two signal lamps which indicate to the operator whether the subscriber's receiver is on or off the hook.

Should either subscriber desire to attract the attention of the operator before a conversation has been finished he can do so by moving his switch hook up and down a few times. While the subscribers are engaged in conversation the lamps in the cord circuit are left completely open so that there is no waste of current from that source. The subscriber's instrument not being grounded, there is no trouble from earth currents. In the subscriber's instrument local dry batteries are used to actuate the transmitter, as this plan has been found to give the best results in practice, both from the standpoint of economy and efficiency. It results in an instrument that combines all the advantages of the local battery in long-distance work and retains all the advantages of automatic signaling. Fig. 2 is a strip of answering jacks which have no closed contacts and therefore no weak points. The board is full multiple, every line being in reach of every operator. Fig. 3 shows a strip of the multiple jacks which have no closed contacts except when the plug is inserted, and, therefore, unlike a series multiple board, there is claimed to be no chance for trouble in loose or dusty contacts. Fig. 4 is one of the subscriber's telephones, with an apartment for holding two dry batteries.

A New Departure in Electric Fans.

The accompanying illustrations show exterior and sectional views of an interesting and new style of electric fans made by the Boston Electric Heating and Power Company, Boston, Mass.

It is intended for use on dining tables during the heated term. It is portable and equally useful on the library table or in the office. The noiseless centrifugal fan which surmounts the motor is so constructed of disks and vertical floats that it delivers air outward and downward in all directions in the form of a cone, therefore, it is claimed, if this apparatus is placed in the centre of a dining table all the persons seated at the table derive equal benefit from its action.

Fig. 1 shows the fan at its lowest point of adjustment, and Fig. 2 shows the fan extended to its full height for largest area of delivery. The motor and fan are adjustable as to height by telescoping in the standard. The purpose of this adjustment is to enlarge the area of the cone of delivery so that the same fan can be adjusted instantly to fit any size table. This feature, combined with the portability of the fan, makes its sphere of usefulness larger than that of the familiar propeller or buzz fan.

FIG. 2.—ADJUSTABLE TABLE FAN EXTENDED.

The sectional view shows the adjustable arrangement and details of the base, standard, motor, fan and fan guard. A, being a plan view, shows the switch and resistance as placed in the base. B shows a complete sectional view, in which is shown the sliding connection by means of which the seven-inch vertical adjustment is obtained. The fan, D, has six vertical floats arranged radially about the axis between an upper and lower curved disk. The in-

FIG. 1.—ADJUSTABLE TABLE FAN.

take is under the canopy guard, C, in the centre of the upper disk, and the outlet is at the outer ends of the floats on all sides at once, as indicated by the arrows. Wires, G, are carried around the tips of the floats to act as guards to prevent accidents from the rapidly revolving fan. The upper or working bearing, E, is a step bearing of tool steel, hardened and ground, in which the step has a downward projecting flange which runs on a hardened steel washer in an oil-cup, F, in such a manner that the shaft itself does not touch the bearing. By this arrangement the possibility of oil working down the shaft is eliminated.

H is the lower or guiding bearing cup, shaped to hold plenty of lubricant. The bottom cap, J, of the motor is provided with the tube, K, which telescopes into the base standard. Within this tube, K, are two smaller brass tubes, L, insulated from, but secured rigidly to the tube, K, and connected at their upper ends with the wires leading to the motor. Into the lower ends of these small tubes, current wires (which are rigidly fastened to the base) telescope. These current wires are connected with a Hart & Hegeman switch giving two speeds. It will be seen that as long as these wires remain in the small tubes the connection between switch and motor is complete. M shows the clamping bolt for holding the motor and fan at any desired height. On the clamping bolt is a washer set in the slot of the standard. This washer runs in a groove in the tube, K, and prevents rotation of the tube, which would destroy the electrical connections, and also prevents the tube, K, from being entirely withdrawn from the base.

The extreme height of the apparatus is 30 inches, and when lowered 23 inches. It carries a 13-inch fan and its current consumption is said to be the same as an ordinary 12-inch buzz fan, due to the vertical axis and the improved hardened bearings. As the 13-inch fan supplied on the banquet fan delivers air over an area of about 10 feet, it is claimed that its capacity for air delivery is greater than any type of 16-inch buzz fan.

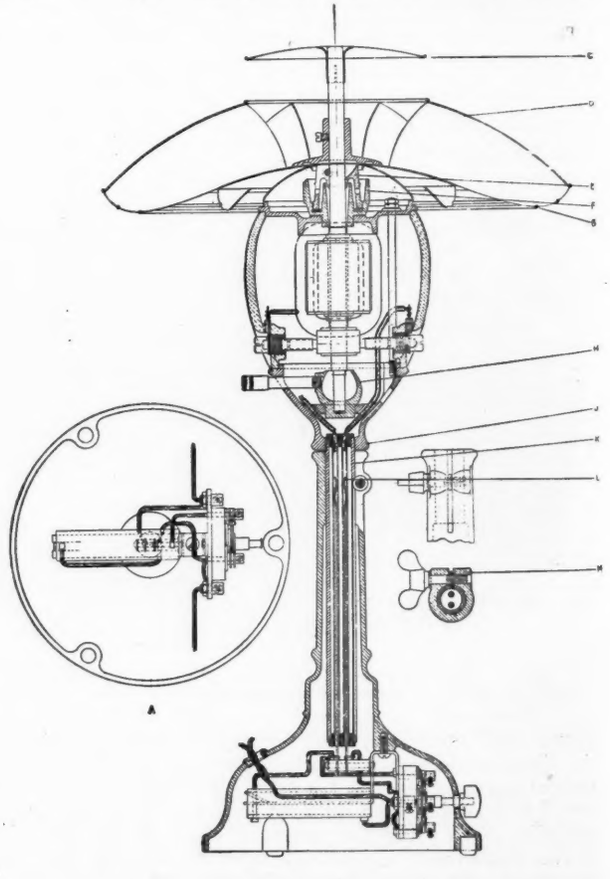


FIG. 3.—SECTIONAL VIEW OF ADJUSTABLE FAN.

New Quarters for the Western Union.

Accommodations in the new Stock Exchange Building, New York city, have been leased by the Western Union Telegraph Company for 21 years at a rental of $25,000 a year.

Current Electrical News

Commercial News

EXPORT AND DOMESTIC

Additions to the electric plant of the city of Belfast, Ireland, are soon to be made at a cost of $475,000. Mr. V. A. H. McCowen is the borough electrical engineer.

The Monterey Steel Works, of Mexico, have placed an order in the United States and England for $1,000,000 worth of machinery. The United States gets the largest portion.

An order for 10 miles of riveted steel pipe, which will be utilized by one of the principal mining companies in the Malay Peninsula, has been obtained by an American company, in the face of keen European competition.

Señor Matias Fibla, of Barcelona, Spain, is desirous of communicating with American manufacturers who want Spanish representation for electrical and railway supplies, machinery and a general line of iron and steel products.

A Philadelphia firm recently obtained a very fair order, through a British engineering company, for the furnishing of electrical overnead crane equipments which will be employed in the workshops of the East Indian railways.

The municipal electrical plant at Amsterdam, Holland, for which bids were recently opened, is to be constructed at a cost of nearly $550,000, the successful bidder being a German concern which is closely affiliated with the General Electric Company.

Reports from Japan state that the dockyard authorities of Kawasaki, who operate one of the largest undertakings of the kind in the Island Empire, are about to place more orders in America for electrical equipment. Among other things specified by the dockyard officials are a 500-horse-power engine and a 300-kilowatt generator.

No one can study railway earnings without realizing the strength of the transportation industry. Gross earnings of all railroads reporting in the United States for the first three weeks of May show a gain of over nine per cent as compared with the corresponding month a year ago and of 26 per cent over the same period in 1899.

Mr. Frederick H. Chamberlain, who is connected with the engineering department of the General Electric Company, recently sailed from San Francisco for Australia, where he will superintend the installation of the $800,000 plant of the Sydney Tramways Company in New South Wales, for which the General Electric Company furnished the equipment.

A representative of a manufacturing house of Manila, P. I., is now in this country placing considerable orders for machinery. He recently stated that the outlook for electrical apparatus, with particular reference to traction and lighting, is as good as could be expected in the Philippines, and before he goes back he will have ordered heavy consignments of such goods.

From interesting statistics gathered by the *Street Railway Journal* it is learned that there are 905 street railway companies operating electric cables and horse railways. The total mileage of single track is given as 20,442 miles, and the total number of cars is 62,918. The aggregate of capital stock for 1900 is $1,066,196,460, an increase over the previous year of $75,183,698. The bonded debt of all roads for 1900 was $866,818,673, an increase over the previous year of $83,855,202.

Messrs. Robert W. Blackwell & Company, 59 City road, London, E. C., England, deny the reported closing of their Paris, France, office, stating that while the director of that office, M. E. C. Beuret, has resigned, and a number of the employés have been dismissed, the office will be retained under the personal supervision of Mr. R. W. Blackwell. As certain of the records of that office are in confusion, Mr. Blackwell requests the patience and courtesy of his many friends and solicits their indulgence for mistakes which may arise, requesting them to call his attention to any orders that may remain unexecuted.

The remark of a leading English trade journal which is particularly conversant with the electrical field is of interest, showing, as it does, the awakening of British manufacturers and dealers to the fact that American methods are winning away the trade which for so many years has been considered England's by every right of prestige and quality. This paper says: "There are unmistakable signs that American manufacturers of electrical machinery and supplies intend to leave no stone unturned to capture a large share of the electrical business in India. Already they have left their impress upon certain schemes and are keeping themselves well alive as to what is taking place. The Tramway Company at Calcutta will shortly adopt electricity as a motive power, and in addition the East India Railway and the Bengal-Nagpure shops, which at present utilize shafts, belting and pulleys, are to discard same for the use of electric motors."

Electric Lighting

Chatham, N. J., will soon issue $15,000 in bonds for an electric lighting plant.

A franchise has been asked for in Denison, Tex., by the Denison Light and Power Company.

A power-house is to be built in Utica, N. Y., by the Equitable Gas and Electric Company at a cost of $40,000.

The city council of Columbus, Ohio, has authorized the issuance of $110,000 in bonds for the completion of the new electric lighting plant.

An alternating-current electric lighting plant is to be erected in Reading, Mich., at a cost of about $6,000. Westinghouse apparatus will be employed.

A franchise has been asked for in Norwood, Ohio, by the Edison Electric Company, of Cincinnati, which desires to install an electric plant in the former town.

A by-law to purchase the local electric light plant for $27,000 was carried at Parry Sound, Ontario, recently, by a majority of the citizens who declared themselves in favor of municipal ownership.

An electric plant to furnish light, heat and power is to be erected at Coopersville, Mich., by the company which is building an electric road from Grand Rapids to Muskegon. The plant will cost over $40,000.

Foundations for the new electric lighting station at Laurel, Del., are being laid. The new company proposes building also a power-house to be used by a contemplated trolley line between Laurel and Georgetown, the county seat.

A company has been formed at Solo, Java, with a capital of some $125,000, with the title of the Solo Electriciteits Maatschappij for the constructing and operating of a central station in that city for public and private electric lighting purposes.

The Oshkosh Electric Light and Power Company will rebuild its entire plant at a cost of between $40,000 and $50,000 as soon as the city lighting contract is awarded. The company and the Oshkosh Gaslight Company are bidding on the city lighting.

The work of putting in the city's electric light plant at Jackson, Tenn., is moving along as rapidly as could be desired. The work at the pump station will soon begin and the poles are being distributed throughout the city. There will be about 85 lights at first.

The fight between the great lighting companies of Cincinnati, Ohio, has ended by the ratification by the stockholders of the Cincinnati Gaslight and Coke Company, of the plan proposed for a consolidation of all the companies. This provides that the stock of the gas company shall be increased to $28,000,000 and that it shall absorb the electric companies and change its name to the Cincinnati Gas and Electric Company.

Electric Railways

Applications for more than one hundred charters for street, elevated and underground railways were filed on June 8 in Harrisburg, Pa., under the new Focht and Emery bills. Thirteen of these roads, with a capitalization of over $7,000,000, are for Philadelphia and vicinity.

It is reported that the Connecticut Lighting and Railway Company has purchased the entire electric street railway properties of New Haven. The negotiations are understood to have been put through by Mr. A. M. Young, of New York. The United Gas Improvement Company, of Philadelphia, is largely interested.

It is announced that King Leopold, of Belgium, intends to create a network of electric railways, requiring a capital of a milliard of francs, to be constructed in the following order: Brussels to Antwerp, Brussels to Ostend, and Brussels to Paris. According to the same authority the consent of the French Government has been secured.

Dr. George S. Gagnon, of New York, expects to build two large hotels at French Lick and West Baden, Ind., and an electric railroad connecting the two towns, which are one mile apart. The enterprise is an investment of $1,500,000. The doctor has secured 230 acres of ground between the two towns, and will build an electric railroad on his own land.

The first inter-city electric railway in Texas was formally put into operation recently, and cars are making regular half-hourly trips between Denison and Sherman, 10 miles south. Including track in both cities, the line is 14 miles long, and is a substantial modern electric railway. The line is owned by Chicago people, and was built by a Chicago company.

New Incorporations

KNOX, IND.— Knox Water, Light and Power Company. $10,000.

FAIRVIEW, GUERNSEY CO., OHIO—Union Telephone Company. $10,000.

DELAWARE CITY, DEL.—Delaware City Light and Water Company. $12,500.

CRAWFORDSVILLE, IND.—Crawfordsville Water and Light Company. $300,000.

DAYTON, OHIO—Thresher Electric Company. $600,000. A. A. Thresher, president.

MANSFIELD, IND.—Mansfield & Carbon Cooperative Telephone Company. $2,500.

SHELBYVILLE, IND.—Shelbyville Water and Light Company. $225,000. Agent, F. M. Nucklaws.

MOUNT AYR, IOWA—Mount Ayr Mutual Telephone Company. $5,000. J. H. Allyn, president.

GARNAVILLO, IOWA—Garnavillo Telephone Company. $10,000. A. A. Schmidt, president.

CHICAGO, ILL.—Telephone Auxiliaries Company. $10,000. Incorporators: H. P. Young and others.

ONEIDA, N. Y.—Oneida Construction Company. $50,000. Directors: C. L. Allen, J. K. Betts and others.

WAXAHACHIE, TEX.—Ellis County Telephone Company. $2,000. Incorporators: C. W. Simpson and others.

WESTFIELD, IND.—White Star Telephone Company. $10,000. Incorporators: T. T. Bray and others.

PLESSISVILLE, QUEBEC—La Compagnie Electrique de Plessisville has increased its capital stock to $60,000.

BUFFALO, N. Y.—Electric Typewriter Company. $100,000. Directors: J. A. and J. B. Roberts, H. Bates and others.

CLAYTON, MO.—National Electric, Gas, Water and Power Company. $2,000. Incorporators: F. W. Hoyt and others.

CHICAGO, ILL.—Independent Telephone Construction Company. $2,500. Incorporators: J. P. Harold and others.

BELVIDERE, ILL.—The Belvidere Telephone Company has increased its capital stock from $25,000 to $50,000.

PAULSBORO, N. J.—Paulsboro Traction Company. $1,000,000. Incorporators: B. C. Paul, G. C. Laws and G. S. Talman.

SPRINGPORT, MICH.—Springport Mutual Telephone Company. $5,000. Directors: S. E. Whitman, D. W. Trine and others.

INDIANAPOLIS, IND.—Jerman Medical Electric Company. $10,000. Incorporators: A. F. and A. M. Teague and E. C. Jerman.

NEW YORK CITY, N. Y.—The Subway Realty Company has increased its capital from $500,000 to $2,000,000. August Belmont, chairman.

IROQUOIS, ONTARIO—The Iroquois Electric Light and Power Company. $10,000. Provisional directors: Patrick, R. D. and W. S. Keefe.

TORONTO, ONTARIO—Kay Electric Dynamo and Motor Company. $40,000. Provisional directors: T. L. Kay, O. Kellond, W. E. Mulholland.

ST. LOUIS, MO.—Collins Electric Company. $100,000—fully paid. Directors: W. F. Kemper, U. L. Collins, W. S. Cowan, F. W. Grumbman.

CANASTOTA, N. Y.—Canastota & Morrisville Railroad Company. $200,000. Directors: J. A. Johnson, W. H. Patten, W. E. Coe and others.

TRENTON, N. J.—Hudson & Middlesex Telephone and Telegraph Company. $15,000. Incorporators: B. S. Klotz, W. P. Lindsley and S. M. Cooley.

CHICAGO, ILL.—The Chicago Telephone Company will issue $1,000,000 additional stock on October 1, and $2,000,000 more stock later on in the year.

WOODLAND, CAL.—The Woodland Consolidated Electric Light, Gas and Power Company has been sold to the Woodland Gas and Electric Company.

CONESTOGA, MD.—Conestoga Electric Light and Power Company. $100,000. Incorporators: E. C. Folger, D. S. Collett, S. C. Long and D. R. Brewer.

NEWARK, N. J.—Essex Cross Railway Company. $500,000. Paid-up capital $27,000. Incorporators: J. A. Lawrence, E. P. Alling, G. A. Smith and others.

CHERRYVALE, KAN.—Cloughley Automobile Manufacturing Company. $100,000. Incorporators: J. H. Brewster, C. A. Mitchell, R. A. Cloughley and C. O. Wright.

FRANKFORT, KY.—Bluegrass Transit Company. $1,000,000. Incorporators: Judge Hanson Kennedy, J. T. Hinton, Younger Alexander, R. C. Talbott and A. S. Rice.

NEWARK, N. J.—American Falls Water Power Company to generate power for lighting, heat, etc. $300,000. Incorporators: E. C. Tracy, F. A. Bridge and C. B. Wisner.

ROCHESTER, N. Y.—Rochester & Southern Traction Company. $1,000,000. Incorporators: D. J. A. Jackson, W. H. Gray, E. W. Horton, A. J. Grany, J. B. Frazer and others.

CHICAGO, ILL.—Reynolds Electric Company; $2,500. Monarch Telephone Company; $1,000. International Telephone Manufacturing Company; $100,000. Incorporators: J. F. Dunlap and others.

YOUNGSTOWN, OHIO—Youngstown & Cleveland Railway Company. $25,000. C. W. French, president. This company is a consolidation of the Youngstown & Chagrin Falls and the Chagrin Falls & Cleveland Railway companies.

OAKLAND, CAL.—Oakland Transit Company. $6,000,000. Directors: F. M. Smith, F. C. Havens, W. H. Martin, J. C. Wimans, S. J. Taylor, E. A. Heron, W. F. Kelly. This company is a consolidation of the Oakland Transit and the Oakland Railroad companies.

CHICAGO, ILL.—X-Ray and Electro-Therapeutic Laboratory; $25,000; incorporators: J. E. Gilman, E. H. Grubbs, R. H. Street. Galvano-Bronze Statuary Company; $2,500. American Bridge Company; capital in Illinois $2,000. The Chicago Heights Terminal Transfer Railroad Company has increased its capital from $5,000 to $500,000.

PHILADELPHIA, PA.—Passyunk Avenue Elevated Passenger Railway; $350,000. Broad Street Subway Passenger Railway; $1,250,000. Western Rapid Transit Street Railway; $360,000. Broad Street Rapid Transit Street Railway; $150,000. Chestnut Hill & Glenside Rapid Transit Street Railway; $150,000. Ridge Avenue Elevated Passenger Railway; $850,000. Frankford Elevated Passenger Railway; $750,000. Northern Rapid Transit Street Railway; $228,000. Germantown Avenue Elevated Passenger Railway; $900,000. Southern Rapid Transit Street Railway; $90,000. Eastern Rapid Transit Street Railway; $540,000. Central Rapid Transit Street Railway; $60,000. Market Street Elevated Passenger Railway; $1,500,000. Incorporators of above-named lines: Jno. M. Mack, Robert H. Foerderer, M. Murphy, Clarence Wolf and Joseph Mack.

Literary

"Eccentricities of Genius" is a very interesting volume of sketches of notable people by Major J. B. Pond, the well-known Lyceum manager of New York. The volume is a large one and its contents are interesting from cover to cover. Instances in the management of the lecturers, readers and entertainers are simply and quaintly told and an insight into the individual is given in a very pleasant yet unique manner. The book is handsomely printed and is dedicated in the following words to a gentleman who is in every way deserving of the kind sentences quoted:

"To George R. Peck—a true friend, a true gentleman, a great lawyer and my ideal orator, I dedicate this book. J. B. Pond."

Automobile Note

For the convenience of those owning electric vehicles or using same, stations for their care and the recharging of their batteries have been arranged for at the following location in New York state: Westchester Village, Union Port, Pelham Manor, New Rochelle (New Rochelle Electric Power-House, Webster avenue), Larchmont, Portchester (Portchester Electric Power House, after June 1); Portchester (directly opposite New York, New Haven & Hartford Railroad Station), Greenwich, Ct. It will be seen by the arrangement of the stations that electricity for vehicles can be obtained from New York city to Greenwich, Ct. Stations are arranged with special care for the convenience of the leading clubs throughout this section. Other stations will be established as required. Further information may be obtained from the Westchester Motor Vehicle Company, Larchmont, N. Y.

Obituary Notices

PROFESSOR VOLNEY GILES BARBOUR, dean of the Engineering School of the University of Vermont, died on June 4 in Minneapolis, Minn. Professor Barbour was born in Connecticut, and received his technical education at the Sheffield Scientific School, Yale University. After nearly 30 years service in the University of Vermont, failing health compelled him to obtain a year's leave of absence in order that he might recuperate, but instead of recovering he slowly failed until the time of his death.

MR. E. W. PARSONÉ died recently in Brazil in his fifty-third year, having for the past 30 years been intimately connected with the submarine telegraph industry. In 1870 Mr. Parsoné joined the staff of the late Sir Charles Bright, and was connected with the cable-laying of the West Indian & Panama Company. In 1884 he was appointed manager of the West African Telegraph Company and organized the service which connects the Cape Verde Islands with the principal settlements on the west coast of Africa. At the time of his death he was manager and secretary in Brazil of the South American Cable Company. The governments of France and Portugal had decorated him for his services, and he was also a Fellow of the Royal Geographical societies, of London, England, and Lisbon, Portugal.

Electrical Securities

The week was quite an active one in securities of all kinds. The quotations for industrial securities reached a higher point than they did before the recent panic, but the market as a whole failed to reach this level. Business generally continues good, and it is thought that the crop situation is better than it appeared a week ago. Still there is considerable impairment in the growth of wheat, corn and other staples as compared with conditions a month ago. This crop uncertainty will have its effect in making conservative the financial powers which have in charge large plans concerning railroad properties. The manufacturing interests throughout the country all report orders ahead. Particularly is this true of United States Steel, which is said to have orders booked for fully seven months.

ELECTRICAL SECURITIES FOR WEEK ENDING JUNE 8.

New York:	High-st.	Low-st.	Closing.
B'klyn R T	83⅞	79⅝	80
Con. Gas	226	220	221
Gen. Elec	250	235½	246¾
Man. El	121½	118	118⅝
Met. St. Ry.	175¾	171¼	171¾
Third Ave R R	124	123½	123½
Kings County Electric	...	...	200
N. Y. & N. J. Tel. Co	...	...	174
Telep., Tel & Cable Co.	...	...	6¼

A most excellent showing is expected by the Western Union Telegraph Company for the current quarter. The talk on the street is that this will be the best in the history of the company, and that the stock, all things considered, is one of the cheapest on the list. It is now selling around 95 and 96.

General Electric took a decided jump during the week. The sentiment in favor of this stock is very bullish, and it is believed that it will pay handsomely for keeping during the next few months.

New York Electric Vehicle Company's stock advanced 2 points on the rumor of the purchase of New England interests of the company which was afterwards found to include only the Newport company.

Brooklyn Rapid Transit is still highly recommended as an investment. The advent of warm weather is sure to bring largely increased earnings. Its chief need now is better facilities for entering Manhattan, and new bridges will bring this about.

The electrical equipment for Manhattan Elevated is coming in rapidly. The directors of this road are quite enthusiastic over the outlook and an increase of dividend is expected from the improvements. Forty carloads of machinery have already been received at the power station. The directors emphasize the fact that all the expense involved in this is already provided for through securities issued and on the market.

The Metropolitan Street Railway Company was very firm all the week from reports of increased earnings. The change from cable to electrical equipment will make quite a saving in operating expenses as well as supply increased facilities for carrying passengers, and the stock is sure to advance in the opinion of insiders as well as the public.

Kings County Electric Light advanced to 205. The stock remains strong around 200, and insiders are confident that it will soon reach 250. This confidence apparently is based on the earnings and the prospect of consolidation with the New York lighting company. The capital stock of this company is low considering the large and important territory in Kings County controlled by it.

Boston, June 8:	Closing.
Am. Tel. and Tel	172½
Erie Tel	58½
New Eng. Tel	142
Mass. Elec. pf	94½
Westing. Mfg. pf	77
Edison Elec	260

It is reported here that the first payment on the increased capital of the American Telephone and Telegraph Company will be called about August 1, and the second about January 1, 1902. The circular is to be issued at once to the stockholders of this company. President Cochrane states that this increase of capital was demanded by the natural growth and expansion of the commerce of the company and will enable an exceedingly profitable business to be done.

The trustees of the Massachusetts Electric Companies have declared a regular semi-annual preferred stock dividend of $2 per share, payable July 1.

Philadelphia, June 8:	Closing.
Elec. Co. of A	8¾
Philadelphia Elec	5¾
Union Traction	26
United G. I. Co	117
Elec. Sto. Bat. c	57
Elec. Sto. Bat. pf	57

There is some dissatisfaction with the terms which the stockholders of the Electric Company of America get under the consolidation plan with the American railways. The stock of the Electric Company of America is very widely distributed.

Chicago, June 8:	Closing.
Chicago Edison Light	175
Central Union Telephone	50
Chicago Telephone	270
Un. Trac	19
Un. Trac. pf	60
Metropolitan El	93⅛

There was considerable demand for Central Union Telephone in Chicago market and the price moved up to 50. Later the announcement of the assessment of $60 per share sent the stock below 40.

Personal Mention

MR. H. H. ROGERS, former vice-president of the Amalgamated Copper Company, has been elected president of that company, to succeed the late Marcus Daly.

MR. W. C. FARRINGTON, late chief engineer of the Houghton County, Mich., Railway Company, has recently been appointed city engineer of Laurium, Mich.

MR. FREDERICK P. FISH sailed on Saturday of last week for England. Mr. Fish will return about the first of July to assume his duties as president of the American Telephone and Telegraph Company.

MR. CHARLES M. JARVIS, late vice-president of the American Bridge Company, recently sailed on the steamer St. Louis for a tour through Europe. Mr. Jarvis expects to return about the middle of August.

MR. E. H. HEINRICHS, for a long time connected with the publishing department of the Westinghouse interests, is president of the Pittsburgh Advertising Company, of the city of Pittsburgh. Mr. Heinrichs is an experienced writer and well understands the art of presenting good advertising matter.

MR. RALPH L. SHAINWALD, president of the Standard Paint Company, New York, sailed for Europe on the Fuerst Bismarck, June 6, on a business trip, and will remain abroad until October. The sale of ruberoid roofing, P. & B. paints, and other of the P. & B. manufactures in Europe has grown so largely and is so constantly increasing as to make imperative Mr. Shainwald's trip for the purpose of still further enlarging the European factory of the company and increasing the already excellent facilities which the company has for handling its foreign business. Mr. Shainwald will visit the company's branches at London, Liverpool, Belfast, Dundee, Glasgow, Paris, Brussels, Berlin, Munich, Helsingsfors, Hamburg, Turin, Copenhagen, Moscow, St. Petersburg, Amsterdam, Vienna, Odessa and elsewhere.

Telephone and Telegraph

Construction work has been begun on the lines of the Kinloch Telephone Company, of St. Louis, Mo., in Alton, Ill., and poles are to be erected within two weeks.

An ordinance was recently passed by the village of Watkins Glen, N. Y., authorizing the Watkins Telephone Company to build and maintain a telephone system within the limits of the village. Messrs. B. C. Hubbell, J. H. Fuller and C. B. Stone, of Cleveland, Ohio, are interested.

The recently incorporated Henry County Home Telephone Company, of Napoleon, Ohio, is reported to have purchased all the lines in that county. A central exchange will be maintained in Napoleon with branches in Liberty Centre and several other small towns in that vicinity.

An entire metallic circuit throughout, and what is practically an entire new system, is planned by the construction department of the Colorado Telephone Company, for the city of Telluride, Colo. The work will probably be completed about July 1 and a complete new equipment installed.

The Columbiana County Telephone Company, of Salem, Ohio, has arranged to purchase the telephone exchanges at Toronto, Ohio, and New Cumberland, W. Va., combining the two as an independent company, which will be headed by Mr. W. F. Crossley, manager of the Columbiana company.

A new telephone organization has been perfected in Westfield, Ind., and will be known as the White Star Telephone Company. The company's capital is $10,000. Its directors are the leading business men of the town among them being Messrs. M. E. Cox, Ellis Roberts, W. W. Mendenhall and others.

The Southern New England Telephone Company, which is the Bell licensee company for the State of Connecticut, has recently issued a circular voluntarily granting 60 hours' pay for 54 hours work to its outside employés. It is thought this action will obviate any labor troubles that might otherwise have been contemplated.

It is reported that the Cunard Steamship Company, of London, England, contemplates installing Marconi wireless telegraph instruments on its transatlantic ships. The matter has been under consideration for some time, and the system has been examined. Some improvements are necessary before all the possibilities of such service can be employed.

The monthly statement of the American Telephone and Telegraph Company for May is as follows:

	1901.	1900.	1899.	1898.
Gross output	85,118	74,340	55,302	32,441
Returned	37,744	23,868	21,265	11,948
Net output	47,374	30,472	34,037	20,493
Since Dec. 20:				
Gross output	373,623	290,533	279,627	142,362
Returned	160,348	106,989	76,061	63,645
Net output	213,275	183,544	203,558	78,717
Total outstanding.	2,164,091	1,764,049	1,328,808	997,838

The important telephone case involving the scope and validity of the Carty bridging bell patent, the invention of Mr. John J. Carty, of New York city, was argued in Pittsburgh last week. The case was presented in the United States Circuit Court, Western District of Pennsylvania, before Judges Acheson and Buffington. Messrs. Frederick P. Fish and George Barton appeared for the Western Electric Company, which owns the Carty patent, and the opposition was represented by Judge R. S. Taylor, of Fort Wayne, and others. The case was presented exhaustively and a decision is expected this fall.

Industrial Items

THE JANDUS ELECTRIC COMPANY, Cleveland, Ohio, has recently issued a new circular dealing with its standard arc lamps, showing the various types manufactured by the company and devoting considerable space to the advantages of the lamp.

THE PHELPS COMPANY, Detroit, Mich., manufacturer of the "Hylo" baby filament lamps, is sending to a few of its friends, as souvenirs of the recent electric light convention, samples of the lamp so that these may "have some personal experience with the only successful turn-down 'electric' ever produced."

SIPE & SIGLER, Cleveland, Ohio, are mailing a handsome catalogue of the Willard storage battery, which they manufacture. The book is one of great interest to any one desiring information on storage battery matters and is a veritable treatise on the subject.

THE EMERSON ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., has issued its fan-motor catalogue for 1901. The customary excellence of the Emerson publications has been maintained in the present booklet, and it continues the high standard already set by this company.

THE HAINES & NOYES COMPANY, Chicago, Ill., manufacturer of telephone apparatus, has recently completed arrangements with Messrs. E. M. Van Duzee, Jr., & Company, Fifth and Jackson streets, St. Paul, Minn., for representation in that city and the state of Minnesota.

THE CROWN WOVEN WIRE BRUSH COMPANY, Salem, Mass., is mailing a neat folder regarding the lubrication of commutators. This company prepares a specially designed lubricant which is stated to cost little and save a great deal of wear on the commutator. Particulars and circular matter may be had on application.

THE CENTRAL ELECTRIC COMPANY, Chicago, Ill., states that it is in a position to make immediate shipments of both large and small orders for telephone construction material, as it carries in Chicago large quantities of cross-arms, pins, brackets, insulators, telephone wires, etc., so that prompt deliveries can be made on any order.

THE PERU ELECTRIC MANUFACTURING COMPANY, of Peru, Ind., has just issued a series of six little booklets on various articles which it manufactures. The latest is one on a porcelain handle and porcelain crossbar baby knife-switch that is approved by the National Board of Underwriters. They are sent upon application, free of expense.

THE CENTURY MOTOR VEHICLE COMPANY, 517-521 East Water street, Syracuse, N. Y., states that the recently circulated report that its plant had been either partially or totally destroyed by fire is absolutely untrue. The company states that its works are in perfect condition, and that it is in a position to fill promptly any orders with which it may be favored.

THE FORT WAYNE ELECTRIC WORKS, INC., Fort Wayne, Ind., is mailing its bulletins Nos. 1,014, 1,015 and 1,016, describing the Wood systems of dynamos, measuring instruments and arc lamps, both direct and alternating current, for arc lighting. Folders are also sent with the bulletins describing the Wood cutouts for arc light circuits and Wood primary fuse boxes.

THE AMERICAN BRIDGE COMPANY, New York, is furnishing 3,000 tons of steel to the Illinois Central Railroad Company for all of its bridge work during the current year, and also more than 1,000 tons of structural steel for the New York Central pier shed, which will be built on Pier 59, North River, New York. R. H. Hood & Company is the contractor for the latter undertaking.

THE GOULD ELECTRIC VEHICLE BATTERY is having excellent success in automobile work. It is claimed that the weight efficiency of the long-distance, high-output type of cell is from 10 to 12 watts per pound. The plates are made of pure lead, spun to increase their surface, and it is claimed that the battery stands a very high rate of discharge without appreciable injury.

THE BERNSTEIN ELECTRIC MANUFACTURING COMPANY, 286 Roxbury street, Boston, Mass., is mailing a very neat catalogue of the Bernstein Lowatt lamps, which it states are not to be confounded with lamps silvered on the outside of the bulb. The catalogue deals with incandescent lamps of all descriptions, and is handsomely illustrated. It may be had upon application to the company.

THE MONARCH FIRE APPLIANCE COMPANY, 27 William street, New York, is mailing a very neat booklet setting forth the advantages accruing to users of "Kilfyre," the company's well-known dry-powder patented fire extinguisher. The book contains illustrations of fires where "Kilfyre" was used with instantaneous effect. This extinguisher is particularly recommended for electrical installations.

THE EUREKA ELECTRIC COMPANY, Chicago, Ill., is sending out corrected blueprint maps showing the toll lines of the independent telephone companies in the states of Indiana, Kansas and Iowa, and is compiling maps of the toll lines of the other states in which the independent companies are represented to any great extent. The maps will be sent gratis to any company desiring them, and the Iowa map is now being distributed.

THE WESTERN ELECTRICAL SUPPLY COMPANY, St. Louis, Mo., has recently taken the agency of the Lowatt incandescent lamp, and states that the success of this lamp in the Middle West has been instantaneous. The company claims that the Lowatt lamp in the concave shape has a measured candlepower at the top of from four to eight times its rated efficiency. Catalogues, descriptive matter and prices of the lamp will be mailed on application.

THE ELECTRIC APPLIANCE COMPANY, Chicago, Ill., describes its new Eaco visual signal telephone switchboard and hotel telephone as two pieces of representative apparatus, stating that they are models and show the rapid strides the company's engineering department has made in this line. This company manufactures all of its own apparatus, and is engaged at present in building equipments for several large hotels in the South and West.

THE ELECTRIC STORAGE BATTERY COMPANY, Allegheny avenue and Nineteenth street, Philadelphia, is mailing a handsome circular of its exhibits of chloride accumulators at the Pan-American Exposition, Buffalo, N. Y. The folder is handsomely gotten up, containing many elaborate charts and handsome half-tone engravings, showing not only the company's exhibit, but a number of interesting installations in various cities throughout the country.

KERITE CABLES FOR THE PHILIPPINES—One hundred and seventy-four miles of Kerite cable were shipped from Mr. W. R. Brixey's factory at Seymour, Ct., last week and taken by train to Bridgeport, there loaded on steam lighters and brought to New York and placed on a government transport, which carries them to the Philippine Islands. There were 26 reels in all, each reel weighing 10 tons. This cable is for the United States Signal Corps, and is to be used in connecting up the different Philippine islands.

THE SHAUGHNESSY AGENCY, 5 Beekman street, New York—Mr. Stephen L. Coles, of this agency, is mailing a striking card to his friends and customers. The card bears upon its face the likeness of a curious Japanese mask and the words, "Not the ghost of a worry need trouble you if you let me prepare and print your catalogues, circulars, booklets, advertising, etc. I give you a bulk price. Then you know just what it's going to cost—and I do all the fussing and worrying. No business is too small for me—if it possesses possibilities of development."

THE NEW YORK CENTRAL LINES reach Buffalo from all directions. This timely statement is made by General Passenger Agent Daniels, of the New York Central Railroad, in an announcement from his literary bureau, which contains the following apt quotation from the ELECTRICAL REVIEW: "Electricity is the key-note of the Pan-American Exposition. Never before in the history of the art has decorative electric lighting been carried to such a point, or handled with such artistic felicity. Both in magnitude, diversity of effect and in beauty, these strange stationary fireworks have surpassed all others that have been attempted."

THE JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., is mailing a catalogue of graphite products which run all the way from lead pencils to barrels of graphited lubricants, specialties, crucibles, graphite phosphorizers, plumbago retorts and graphite electrical supplies for general use. The catalogue is one of unusual interest, and contains, in addition to other handsome plates, a two-page half-tone of the company's factories in Jersey City, and its graphite works at Ticonderoga, N. Y. On other pages are additional views of the graphite mines and cedar mills from which come the company's raw material.

THE BULLOCK-WAGNER ELECTRIC MANUFACTURING COMPANY is mailing a little folder which it calls "A Step Forward," being devoted to a brief description of the industries in which the two companies were originally engaged. The new organization, which is an affiliation of the sales departments of the two corporations, has been perfected by Mr. E. H. Abadie, formerly sales manager of the Wagner company, and the two now operate as one, the selling arrangement being such that all territory east of the eighty-fifth meridian will be handled by the Bullock, while all territory west of that line is in charge of the Wagner company.

THE ERICSSON TELEPHONE COMPANY, 296 Broadway, New York, states that the Ericsson telephones were awarded first prizes at Paris in 1881, Madrid in 1883, Vienna in 1884, Stockholm in 1886, Copenhagen in 1888 and Chicago in 1893. The company also states that its exhibit in Paris in 1900 was from the factory in St. Petersburg, Russia, this exhibit also taking the first prize. This year the company's exhibit of a 50-line subscriber's switchboard and a few types of telephone instruments is in Section S of the Electricity Building at the Pan-American Exposition in Buffalo. A cordial invitation is extended by the company to all its friends and patrons to look over the exhibit and investigate the merits of the instruments shown.

WILLARD STORAGE BATTERIES—Among the contracts for Willard storage batteries closed by Messrs. Sipe & Sigler, of Cleveland, Ohio, during the past few weeks are five storage batteries for lighting and coast defense work to the United States, four to be installed at Fort Williams, off the coast of Portland, Me., and one to be installed at Fort Adams, off the coast near Newport, R. I., one large battery for municipal lighting for the city of Dawson, Minn., one large lighting plant for the Francescan Sisters, Francescan Monastery, Oldenburg, Ind., and one battery for the operation of a combination fire apparatus wagon manufactured by the Fire Extinguisher Manufacturing Company, Chicago, Ill. The latter will be the largest battery ever used in the operation of a vehicle on the highway. The battery alone will weigh nearly three tons. The completed wagon will weigh more than seven tons.